TECHNOLOGY DEPT.

A PICTORIAL SURVEY OF CURRENT PRACTICE, EQUIPMENT AND MATERIALS

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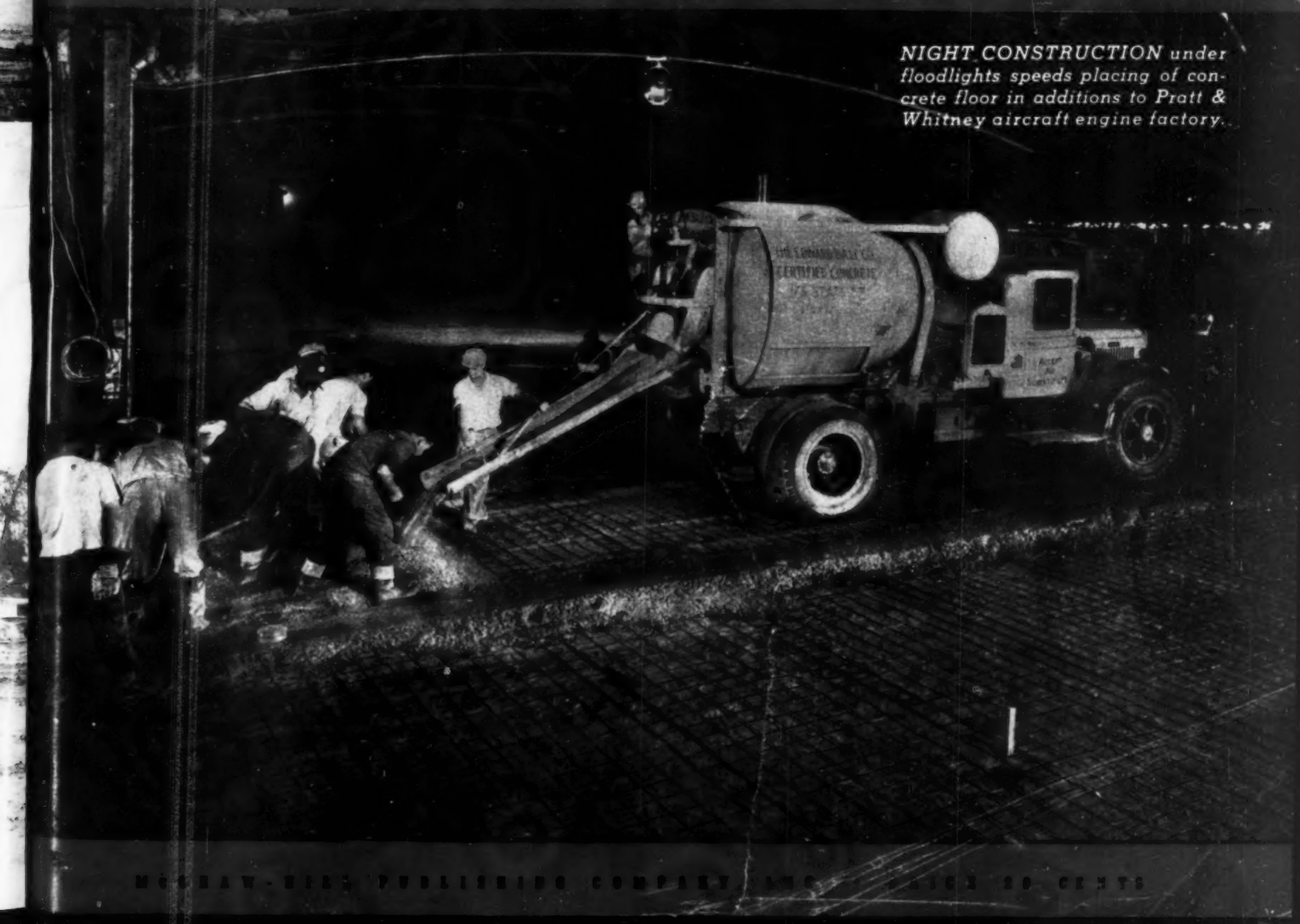
OCT 23 1940

Construction Methods

OCTOBER 1940

Construction for National Defense—Six pages of Pictures of Typical Army and Navy Projects • Aircraft Engine Factory Expansion Rushed to Completion in 12 Weeks • Belt Conveyors for Construction Projects—By A. J. Ackerman, of Dravo Corp. • Large Plant Additions for Consolidated Aircraft • New Hangar for United Air Lines • Mass Housing in California • Vacuum Concrete Refaces Surfaces.



NIGHT CONSTRUCTION under floodlights speeds placing of concrete floor in additions to Pratt & Whitney aircraft engine factory.

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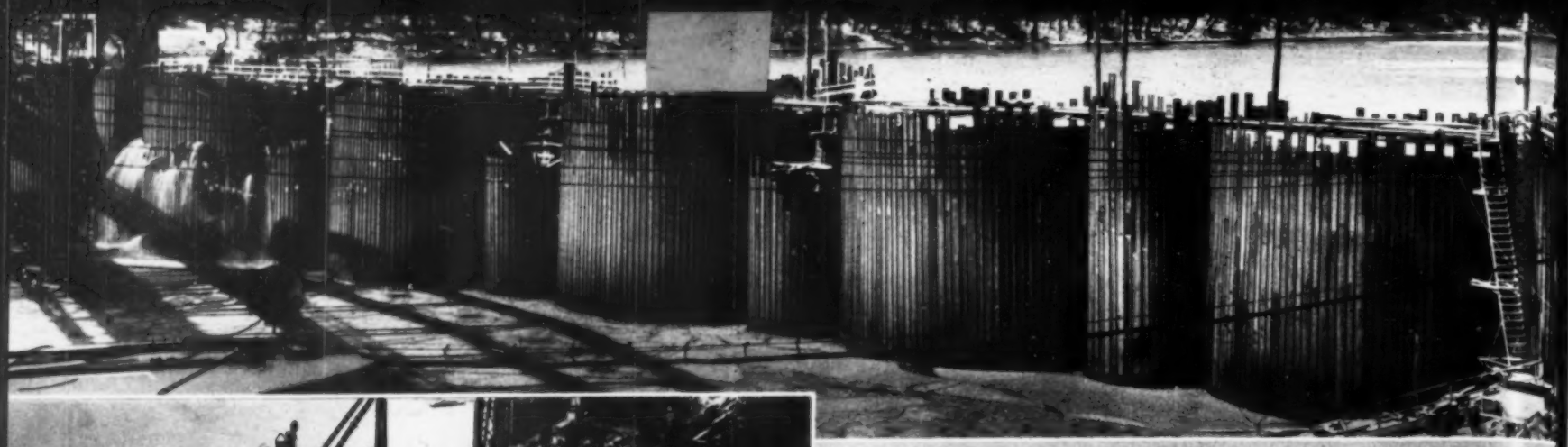
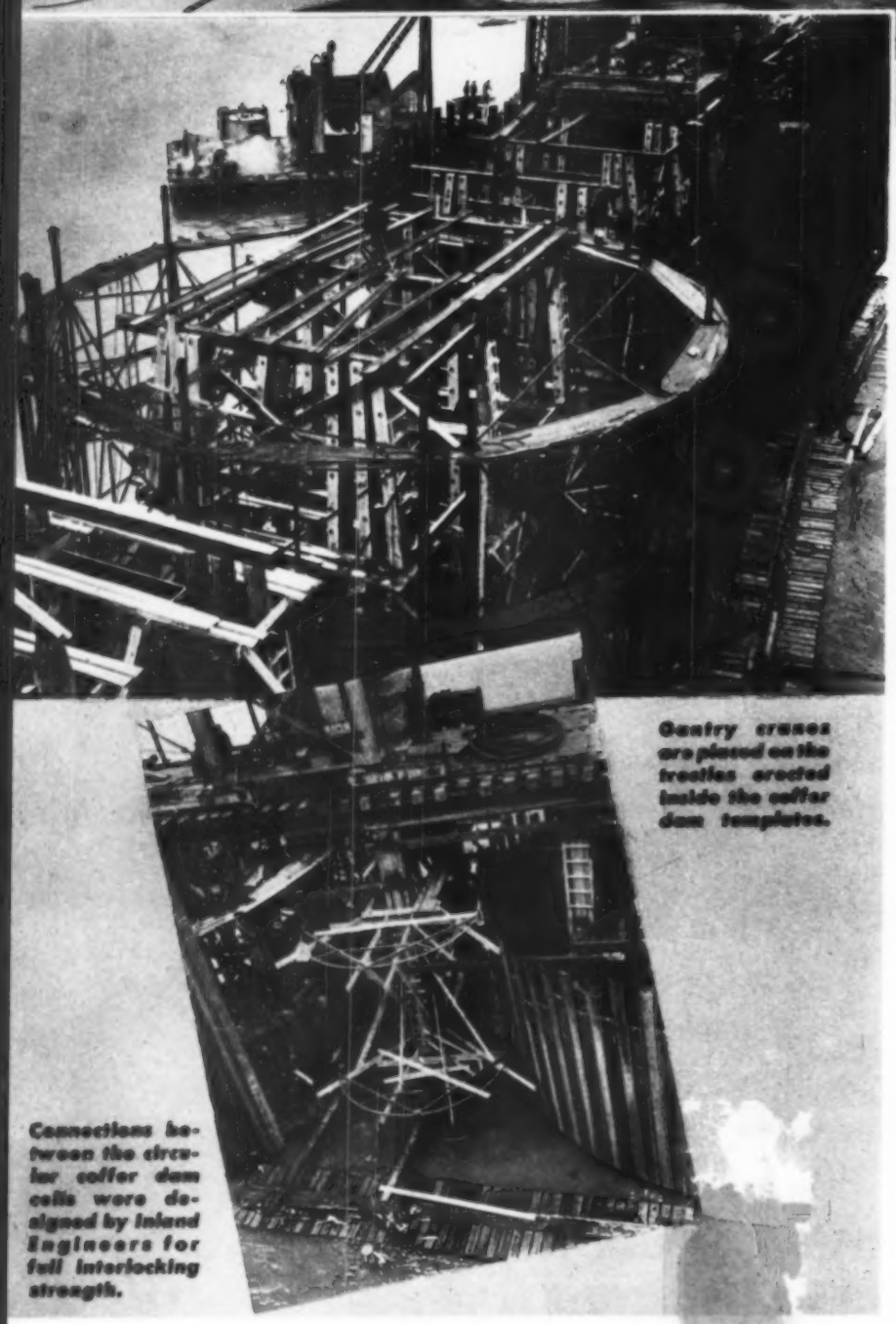


The first section of the Gilbertsville Coffer Dam will enclose about 40 acres. Inland Piling is being used for both sections.



Gantry cranes are placed on the trestles erected inside the coffer dam templates.

Connections between the circular coffer dam cells were designed by Inland Engineers for full interlocking strength.

Interlock Strength Carried Through Assembled Sections by INLAND DESIGN

AT Gilbertsville, Ky., the Tennessee Valley Authority is building one of the largest coffer dams ever erected for dam construction. When the TVA had completed their design, various groups of engineers were consulted to check the plans against design specifications. It was the Inland Engineers who designed the fabricated sections to carry the specified interlock strength, thereby giving equal safety to every part of this huge coffer dam. Inland Piling, in thousands of tons, is now being driven at the Gilbertsville Project.

You, too, can assure full strength at every connection, and as well avoid over-design and excessive tonnage by consulting Inland Engineers. Their broad experience also covers economies of construction such as templates, easily movable leads, etc. Cost-saving Inland Engineering Service is yours without obligation. Write for the Inland Piling Book.

SHEETS • STRIP • TIN PLATE • BARS • PLATES • FLOOR PLATES
STRUCTURALS • PILING • RAILS • TRACK ACCESSORIES • REINFORCING BARS

TECHNOLOGY DEPT.

INLAND STEEL CO.

PILING

38 S. Dearborn Street, Chicago • Sales Offices: Milwaukee, Detroit, St. Paul, St. Louis, Kansas City, Cincinnati

CURRENT JOBS

.... and Who's Doing Them

BUILDINGS

Public — At Radford, Va., the **Hercules Powder Co.**, of Wilmington, Del., will supervise construction of smokeless powder plant for the War Department, at cost of $25,000,000. **Chrysler Corp.**, of Detroit, Mich., will supervise the building of a military tank plant to cost $20,000,000, in Detroit, for the War Department. At Fort Knox, Ky., the **Struck Construction Co.**, of Louisville, received contract to build 149 barracks, 72 mess halls, 73 recreation buildings, 76 single storehouses and company administration buildings for $1,159,000. Successful bidder for contract to construct temporary buildings at Fort Benning, Columbus, Ga., was **Williams Lumber Co.**, local contractor, with price of $2,079,790. **Ford J. Twaits Co.** and **Morrison-Knudsen Co.**, both of Los Angeles, Calif., were awarded contract to construct temporary housing facilities, administration buildings, barracks, blacksmith shops, company storehouses, fire houses, guardhouses and hospital at Camp Ord, Calif., for $2,731,000. At Alberta, Canada, ammonium nitrate plant is under construction by **Consolidated Mining & Smelting Co. of Canada, Ltd.**, Vancouver, B. C., for $8,000,000. **Hunkin-Conkey Construction Co.** of Cleveland, Ohio, was awarded contract for ammunition loading plant, 250 buildings, factories, warehouses, offices, power plant, sewer and water lines, paving, sidewalks and airport for Atlas Powder Co., in Ravenna, Ohio, for $14,200,000. Temporary housing for New Jersey National Guard at Fort Dix, N. J., will be constructed by the **George A. Fuller Co.**, of Philadelphia, Pa., for $5,531,000. Air Corps repair shop at Southeast Air Depot, in Mobile, Ala., is under construction by **A. J. Rife Construction Co.**, of Dallas, Tex., for $1,350,000. Storage warehouses at Quartermaster Depot in Jeffersonville, Ind., will be built by **G. H. Rommel Co.**, of Louisville, Ky., for $1,262,800.

Industrial — Contract for group buildings for manufacture and assembly of airplanes for Lockheed Aircraft Co., in Burbank, Calif., was awarded to **H. W. Baum**, of Los Angeles, for $1,500,000. **M. W. Kellogg Co.**, of New York City, was awarded contract for expansion to refinery of Magnolia Petroleum Co., at Fort Worth, Tex., for $2,000,000. In East Hartford, Conn., **Turner Construction Co.**, of Boston, Mass., is building brick monitor-type aircraft engine plant for Pratt & Whitney Division of United Aircraft Corp., for $2,000,000. In Chicago, Ill., warehouse is under construction by **J. Griffiths & Son**, local contractor, for $2,000,000. In Montreal, Quebec, Canada, a chemical plant to manufacture sulphuric acid, will be built by **Atlas Construction Co., Ltd.**, of Montreal, Canada, for $1,000,000. A recycling plant, in Shreveport, La., to cost approximately $1,250,000 will be built by **Hudson Engineering Co.**, of Houston, Tex.

HEAVY CONSTRUCTION

Powerhouse foundation for Bonneville Dam, in Oregon, will be constructed by **Puget Construction Co.**, of Bellevue, Wash., for $3,131,606. Reconstructing Grays Harbor north jetty in Washington, is under way by **Columbia Construction Co.**, of Westport, Wash., for $1,720,354. Contract for construction of reinforced-concrete conduit to inclose Park River, in Hartford, Conn., went to **B. Perini & Sons, Inc.**, of Framingham, Mass., for $2,877,784. In New York, N. Y., contract for bulkhead wall, sewer construction and fill went to **Reiss & Weinsier, Inc.**, of Brooklyn, for $1,386,739. Shipway and drydock for aircraft carriers in Newport News, Va., are under construction by **Dravo Corp.**, of Pittsburgh, Pa., for $2,000,000. **Guy F. Atkinson Co.**, of San Francisco, and **George Pollock Co.**, of Sacramento, were successful bidders for contract for fleet operating base at San Pedro, Calif., for $18,012,500 on cost-plus-fixed-fee basis. New ship building ways in Boston, Mass., will be constructed by **New England Foundation Co., Inc.**, local contractor, for $665,000 on cost-plus-fixed-fee basis.

HIGHWAYS AND BRIDGES

Among recent highway and bridge contract awards are the following: Florida: $217,620 to **H. E. Wolfe Construction Co.**, of St. Augustine. Illinois: $501,159 to **Cameron Joyce & Co.**, of Keokuk, Ia. Mississippi: $525,430 to **W. G. Cook**, of Forest. New Jersey: $209,078 to **C. T. Burket**, of Vineland; $197,718 to **Thomas Gallo**, of Newark; $190,555 to **Jannarone Construction Co.**, of Belleville. New York: $413,120 to **Arute Bros., Inc.**, of New Britain, Conn.; $349,266 to **Oneglia & Gervasini, Inc.**, of Torrington, Conn.; $220,801 to **Belmar Co.**, of Troy. North Carolina: $274,394 to **W. F. Bowe, Jr.**, of Augusta, Ga. Pennsylvania: $633,382 to **Laub & Collins**, of Addison; $294,390 to **Quarry Stripping & Construction Co.**, of Hazleton; $333,600 to **Baldwin Bros. Paving Co.**, of Cleveland, Ohio; $652,707 to **L. M. Hutchinson**, of Mt. Union. Texas: $390,870 to **L. H. Lacy**, of Dallas; $354,369 to **Cage Bros.** and **F. M. Reeves & Sons**, of Bishop. Grade separation contract in Brooklyn, N. Y., went to **Mill Basin Asphalt Co.**, local contractor, for $812,181. Contract for overpass in Fayette County, Pennsylvania, went to **Midwest Construction & Asphalt Co.**, of Chicago, Ill., for $241,370. **Bowers Construction Co.**, of Raleigh, N. C., was awarded contract for bridge approaches in Virginia, for $288,364. With price of $435,069, **Bero Engineering & Construction Corp.**, of North Tonawanda, N. Y., was successful bidder for contract for bridge in Chautauqua County, New York.

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N. A. Bowers (San Francisco) Nelle Fitzgerald
A McGRAW-HILL PUBLICATION

The HOW of it

For the benefit of readers concerned with the practical application of method or equipment the following references are to articles or illustrations in this issue that tell:

How **RIVER WAS DIVERTED** to carry flow around dam site.—p. 39

How **PAVING OF 5-IN. FLOORS** of aircraft engine factory was done with aid of truck mixer fleet. —p. 48

How **ROOFING WAS LAID** rapidly on monitor-type factory building. —p. 50

How **MOVABLE LADDER,** used as scaffold by painters, was supported by suspension cables. —p. 51

How **DOUBLE HOOKS** on pipe handle lifted heavy loads.—p. 51

How **WOOD ROOF TRUSSES** for housing project were cut and fabricated by production line methods. —p. 52

How **TWO HEAVY-DUTY DRILLS** were used simultaneously to make bolt holes in rafters. —p. 53

How **NUTS** in ring connector joints were turned up by electric nut-runner. —p. 53

How **BELT CONVEYORS** solve material-handling problems of construction jobs. —p. 55

How **AIRPLANE TRIPPER** diverted flow of concrete aggregates from belt conveyor to stockpiles. —p. 58

How **TRAVELING HOPPERS** delivered earth from power shovels to belt conveyor on skid frame. —p. 58

How **UNDERGROUND PIPES** were detected by electrical equipment on excavator. —p. 60

How **DRIVING HEADS** for piles were fabricated by arc welding. —p. 60

How **TELESCOPIC METAL SPOUT** handled cement at batching plant. —p. 61

How **COUNTERPOISE WIRE** was installed underground by special tractor-drawn plow. —p. 61

How **STEEL ERECTION** for aircraft assembly building was handled by truck-mounted cranes. —p. 63

How **VACUUM MATS** applied thin facing of concrete on ash bunkers. —p. 64

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THE JOB JESTER

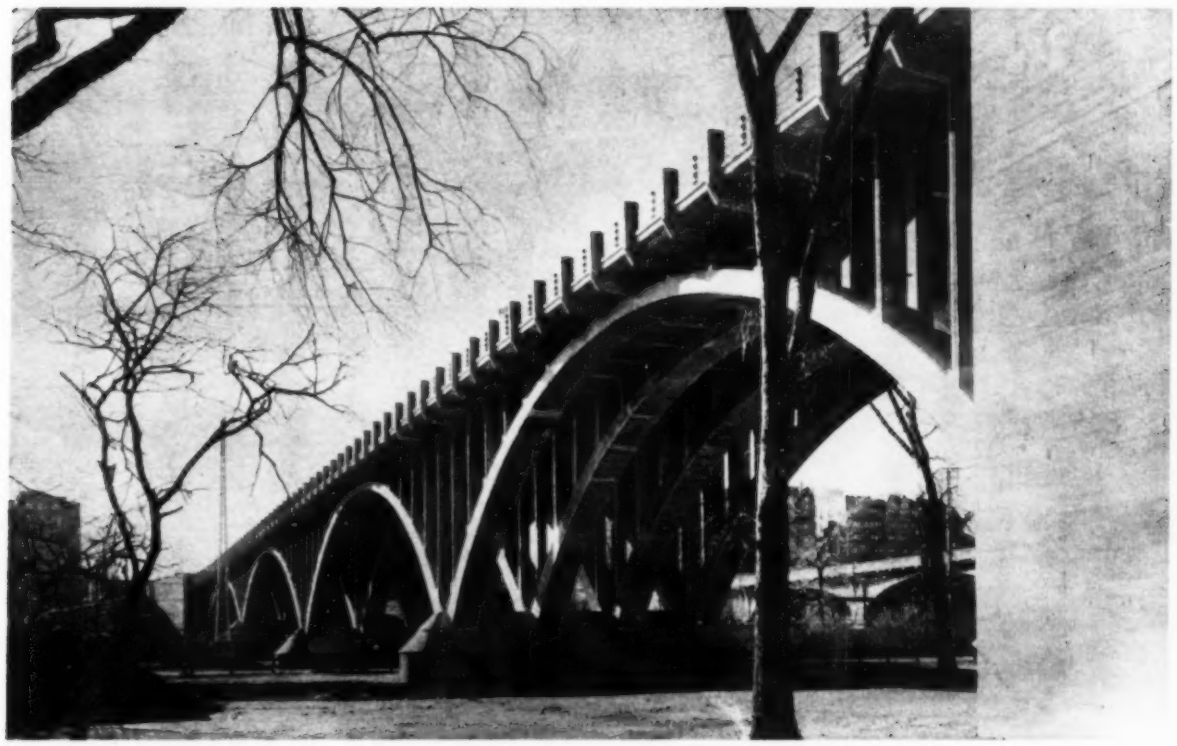
CARTOONS DRAWN FOR CONSTRUCTION METHODS

"Easy on the swing stuff... we were sent to demolish only one house."

"Sunday driver!"

"George has it pretty soft... having that pet woodpecker!"

TOP-SPEED CONSTRUCTION AT ROCK-BOTTOM COST



'INCOR' CUTS COSTS

ON FLEETWOOD BRIDGE

CROSS County Parkway toll bridge at Fleetwood, N.Y., is a vital link in Westchester County's highway system. High early strength cement, specified for arch ribs by Westchester County Park Commission, saved thousands of dollars on forms and false-work.

Using 'Incor' 24-Hour Cement, Foley Brothers, Inc., Pleasantville, N.Y., contractors, formed one row of ribs, stripped according to specifications the third day, then moved forms sideways. Three-day strengths averaged 3,600 lb.

Substantial Saving on Bridge-Deck

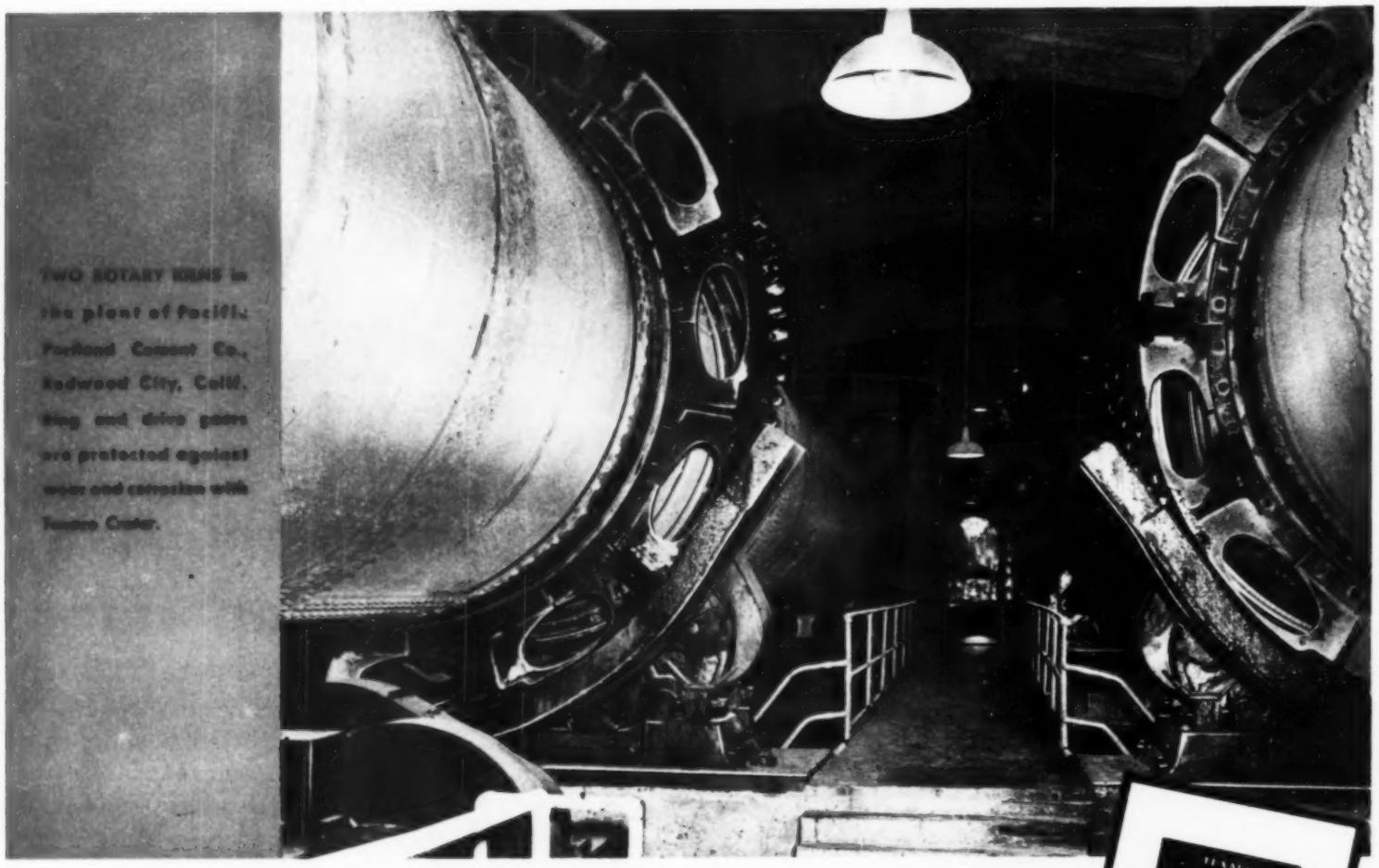
Performance on the ribs caused Foley Brothers to use 'Incor' for the deck—with further substantial savings on forms and overhead. Contract carried $700-a-day penalty clause, but job was finished 2 weeks before deadline.

Roadway was placed in cold weather; 'Incor'* minimized frost risk, cut costs, speeded job progress. Typical 'Incor' performance. Write for copy of "Cutting Concrete Costs." Lone Star Cement Corporation, Room 2264, 342 Madison Avenue, New York. *Reg. U. S. Pat. Off.

LONE STAR CEMENT CORPORATION

MAKERS OF LONE STAR CEMENT · · · 'INCOR' 24-HOUR CEMENT

CEMENT MILL LENGTHENS GEAR LIFE



TWO ROTARY KILNS in the plant of Pacific Portland Cement Co., Redwood City, Calif. Ring and drive gears are protected against wear and corrosion with Texaco Crater.

PRODUCING portland cement from oyster shells, the Pacific Portland Cement Co. has been keeping friction losses and upkeep costs to a rock bottom figure. Open gears on their kilns, oyster shell dryers and clinker coolers have shown less wear, and required practically no attention.

For 10 years, these open gear teeth have been protected against wear and corrosion by lubrication with *Texaco Crater*.

Texaco Crater coats gear teeth with a tough, viscous water and chemical resistant film that lubricates, protects against wear and weather. Highly adhesive and cohesive, it clings, resists channeling and prevents metal-to-metal contact.

Trained lubrication engineers will gladly cooperate in making savings in your equipment. Just phone the nearest of more than 2300 Texaco warehousing points in the 48 States or write to:

The Texas Company, 135 East 42nd Street, New York, N. Y.

32-PAGE BOOK. Practical, money-saving information on open gear and wire rope lubrication and protection. Yours for the asking.

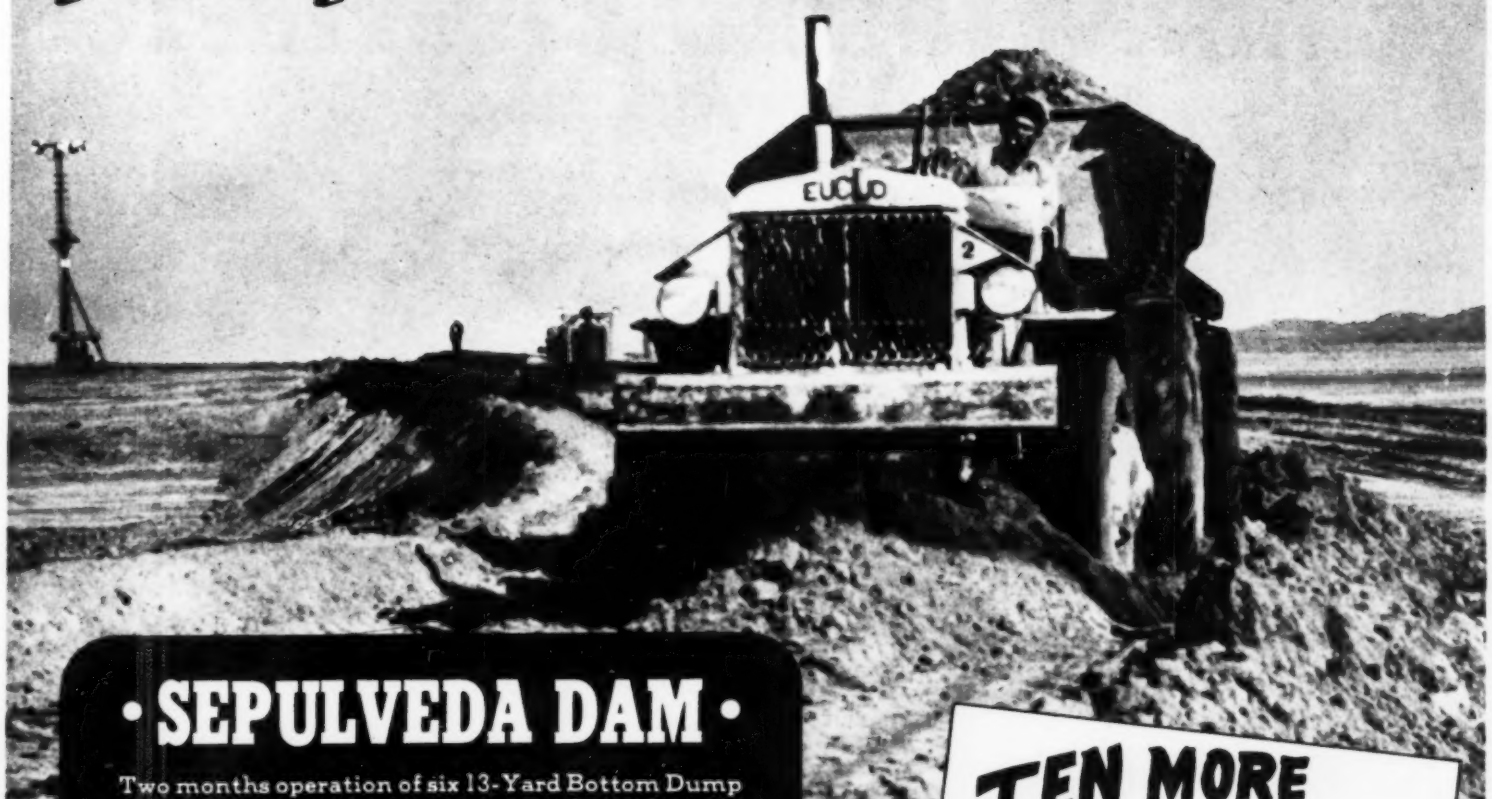
TEXACO

TEXACO DEALERS INVITE YOU to enjoy Fred Allen in the new full-hour program of *The Texaco Star Theatre* . . . with Kenny Baker, Al Goodman's Orchestra and a great cast. Every Wednesday Night, Columbia Network. 9:00 E.S.T., 8:00 C.S.T., 10:00 M.S.T., 9:00 P.S.T.

TEXACO CRATER

6 + 6 = 12

proving EUCLIDS sell themselves!



• SEPULVEDA DAM •

Two months operation of six 13-Yard Bottom Dump EUCLIDS on Sepulveda Dam proved conclusively that these EUCLIDS have got what it takes to do the job quicker and at a lower cost — so Sepulveda Constructors bought six more, making their fleet total twelve 13-Yard Bottom Dump EUCLIDS.

This is just another instance of EUCLIDS selling themselves by demonstrating their remarkable superiority for hauling earth quickly and economically.

Investigate EUCLIDS today — increase your profits with EUCLIDS tomorrow!

TEN MORE

WESTERN JOBS FORGING AHEAD WITH EUCLIDS

	EUCLIDS
Dead Man's Basin — Shawmut, Montana Lobnitz Brothers	8
Deer Creek Dam — Provo, Utah Rohl-Connolly Company	6
Gravel Plant — Healdsburg, California Basalt Rock Company	1
Long Valley Dam — Bishop, California J. F. Shea Co., Inc.	6
Marysville Levee — Marysville, California Louis G. Frick Construction Co.	7
Mill Creek Dam — Walla Walla, Washington Parker-Schram Co., and Eaton & Smith	10
Rock Plant — Point Richmond, California Basalt Rock Company	2
San Fernando Reservoir — San Fernando, California Clyde W. Wood	4
Vallecito Dam — Bayfield, Colorado Martin Wunderlich Company	25
Willow Creek Dam — Lodge Grass, Montana R. P. England	7

EUCLID
THE PIONEER

THE EUCLID ROAD MACHINERY CO.

CLEVELAND, OHIO U. S. A.

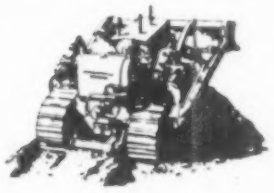
New Peaks of Efficiency in DIESEL Power

...in the 4 New INTERNATIONAL TracTracTors!

The powerful International TD-18, shown building firebreaks in California, is the largest of the four TracTracTors. It has a 6-cylinder engine and 6 forward and 2 reverse speeds.

Keep on the Profit Side with TRACTRACTORS

In terms of *performance, operating economy, low maintenance,* and *long life,* the FOUR NEW INTERNATIONAL DIESEL TRACTRACTORS are in a class by themselves . . . far ahead of anything you've seen yet in crawler power. The big TD-18 set a new pace when it got on the job last year. The TD-14, TD-9, and the small TD-6 are following right on its heels with their good work.



These Features Mean Savings

This quartet of streamlined efficiency has *everything* users have needed and asked for in crawler tractors . . . features and qualities that put TracTracTors well in advance of the market. On-the-job evidence proves the great value of such points as these: Quick, easy starting, *full* International Diesel engines that really provide *full* Diesel fuel economy; wide range of traveling speeds and fast gear shifting; easy-operated, multiple-disk steering clutches; *exclusive* track frame stabilizer and ball-and-socket pivot construction which relieves the pivot shaft and track frame of leverage loads and assures positive track alignment; long-lived, quintuple-sealed track rollers; and accessibility that can't be matched.

A Size for Every Job

Choose the size or sizes of TracTracTors best suited for your work. Pair the power up with balanced allied equipment. Then you'll have an outfit that knocks the spots out of anything it goes up against. Get acquainted with International Diesel TracTracTors—call the nearby International industrial power dealer or Company branch.

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)
180 North Michigan Avenue Chicago, Illinois

The International TD-14 working on a dam site in Texas for Contractor Charlie Williamson. This medium-large TracTracTor has power to handle 6 to 7-yard hauling scrapers, 10 to 12-foot bullgraders, 8 to 10-foot bulldozers, 10-foot blade graders, and other allied equipment of comparable capacity. The TD-14 is a popular size that fills the bill on a wide range of jobs.

Here is an International TD-9 owned by C. C. Logan, building storage ponds in Oklahoma. This model is designed to power 7 and 8-foot bulldozers, 8 and 10-foot bullgraders, 3 and 4-yard hauling scrapers, 8 and 10-foot blade graders, and other equipment of similar size. This medium-small unit is setting new standards for crawler power in its class. It is built to stand a lot of punishment.

INTERNATIONAL Industrial Power

THE START
of the pouring

1 DAY
22 ft. completed

2 DAYS
43 ft. completed

3½ DAYS
job is finished

62 Foot Silos Erected in 3½ Days

Using One Four-Foot Moving Form

and Penn-Dixie Cement

Silo construction at the Bronx, N. Y. Board and Plaster Plant of the National Gypsum Company is graphically shown in this interesting set of progressive photos. Silos were built by the Macdonald Engineering Company of New York and Chicago. Consulting engineers: H. K. Ferguson Company, Cleveland, Ohio.

Work began August 13. One four-foot moving form was used. The job progressed rapidly. On August 14 silos were up 22 feet. Next day, silos were 43 feet high and by afternoon of August 16 the total height of 62 feet had been attained and silo wall construction was finished in only three and a half days.

"We made remarkable time", states the Macdonald Engineering Company. "More important still, we got a beautiful job of work. A further interesting point is that we used only a six bag mix of your regular portland cement and we never had the sign of a "fall out" on any part of the work.

"This is a case where we are pleased . . . the engineers are pleased and the owners are pleased with the exceptionally fine results."

Whatever the concrete job—large or small, simple or intricate—contractors, engineers and owners are relying fully upon the "exceptionally fine results" obtained with both regular PENN-DIXIE CEMENT and (when greater speed is required) PENN-DIXIE HIGH EARLY STRENGTH CEMENT for quick-curing concrete that offers time and money-saving advantages.

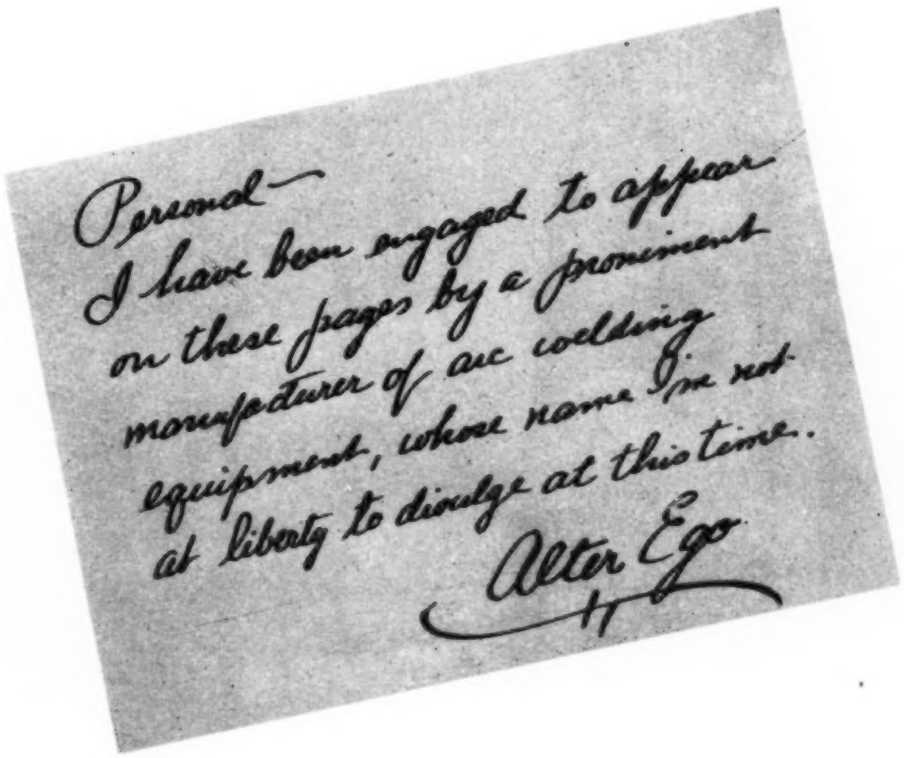
Two interesting, helpful booklets—"Penn-Dixie Concrete Tables" and "Modern Quick-Use Concrete" will be sent on request. Write for them today.

Pennsylvania-Dixie Cement Corporation, 60 East 42nd Street, New York, N. Y. Boston, Rochester, Philadelphia, Atlanta, Des Moines, Chattanooga.

PENN-DIXIE

PENN-DIXIE

HIGH EARLY STRENGTH AND REGULAR PORTLAND CEMENTS

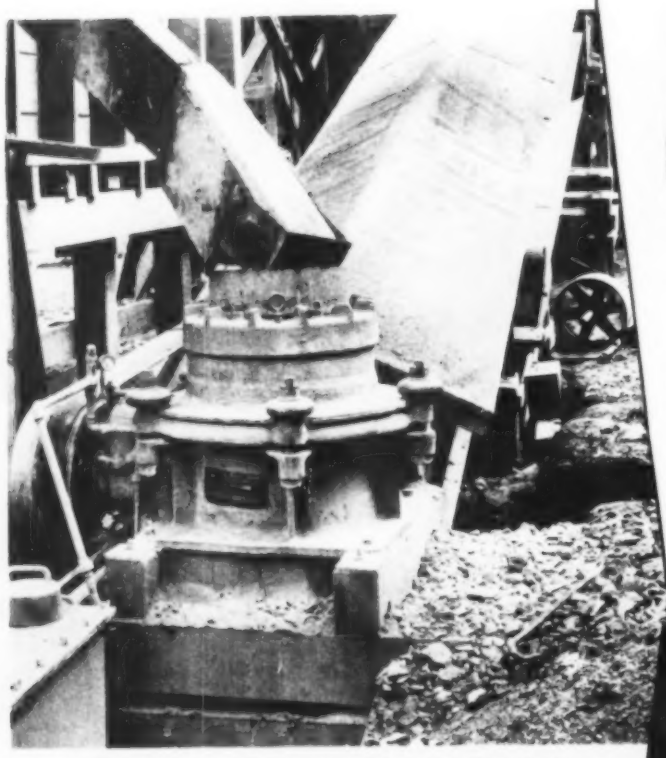

Personal—
I have been engaged to appear
on these pages by a prominent
manufacturer of arc welding
equipment, whose name I'm not
at liberty to divulge at this time.
Alter Ego

"CAPACITY for minus ½" stone is UNSURPASSED..."

TELSMITH

INTERCONE

CRUSHER



MURPHY CONSTRUCTION COMPANY, INC.
MONONGAHELA BLDG.
MORGANTOWN, WEST VA.

THOMAS MURPHY, PRES. & GEN. MGR.
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J. F. TAIT, SECRETARY

PHONES
OFFICE—4488
SHOP—3714

August 1st, 1940

Smith Engineering Works
Milwaukee, Wisconsin

Attention: Mr. D. D. Barnes, Sales Manager

Gentlemen:

We are in receipt of your letter of July 30th in which you request some information relative to the operation of our recently purchased Telsmith Intercone Crusher.

We are very pleased to furnish you with this information together with some additional comment. This crusher was put into service by us six or eight weeks ago and has been in continual operation since that time. We are very much pleased with its performance, in fact its efficiency is somewhat beyond our expectation. We believe that this crusher very definitely fills a much needed demand for a crusher of this type in this particular field. Its capacity for the reduction of two inch stone to a one-half minus size is unsurpassed in our experience. Another very desirable feature of the crusher is that in a reduction of this range the percentage of fines below No. 50 mesh is negligible, which of course effects considerable saving in waste material to the producer.

We extend to you our entire satisfaction

It is with pleasure that we extend to you our entire satisfaction with this equipment.

Yours very truly,

MURPHY CONSTRUCTION COMPANY, INC.

By: Thomas Murphy
President.

TMV

Enc.

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PLEASE ADVISE HOW SOON YOU COULD SHIP ANOTHER INTERCONE CRUSHER TO MURPHY CONSTRUCTION COMPANY AN EXACT DUPLICATE OF ONE ALREADY DELIVERED WITH POSSIBLE EXCEPTION THAT A SLIGHTLY LARGER HEAD MIGHT BE USED STOP PLEASE WIRE POSTALTELEGRAPH=

CHARLESTON TRACTOR AND EQUIPMENT CORP
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IC-3

PROVED PERFORMANCE

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AND YOU GET ALL THESE FEATURES

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Write for Bulletin IC-10

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Investigate The AMERICAN BOSCH MAGNETO TRADE-IN PLAN

LIBERAL TRADE-IN ALLOWANCE ON YOUR PRESENT MAGNETO!

WHY IT PAYS TO HAVE A MODERN MAGNETO

Here's why the modern American Bosch Super-Powered Magneto often cuts overhaul costs more than half, saves you money. Take advantage of the new American Bosch Magneto Trade-in Plan.

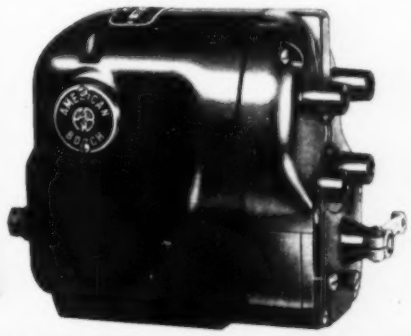
At left is a typical example of the expensive, commonly required replacement parts necessary in an old-style magneto. At right you see the fewer, sturdier, less expensive parts which accomplish the same function and make the modern Super-Powered American Bosch a better, more rugged, more dependable, more economical magneto.

Are Your Magnetos Costing Too Much? Maybe it's more ECONOMICAL TO REPLACE *than to* REPAIR . . . *Examine the facts!*

Is it worthwhile to overhaul your old style magneto? Probably not, especially if major parts need replacement. For even when these parts have been replaced, it's still not a modern magneto!

Why not trade it in for a modern, up-to-the-minute super-powered American Bosch Magneto? Modern—the magnet is made of Alnico, amazing new magnet metal which has revolutionized magneto design. Modern—the American Bosch Super-Powered Magneto has fewer rotating parts, less expensive parts, much sturdier construction that often slashes upkeep costs 50% or more!

Why not enjoy the plus in performance, the minus in maintenance which is yours with the modern American Bosch Magneto? Why not take advantage today of our liberal trade-in plan? Any American Bosch service station will be glad to supply full details. Or write our factory for "A Message To Magneto Users."



AMERICAN BOSCH CORPORATION
Springfield, Massachusetts

The American Bosch Magneto Trade-In Plan is subject to change or withdrawal without notice.

AMERICAN BOSCH *Super Powered* MAGNETO

THE ECONOMY TRUCKS

FORD

Big jobs are in the making for 1941. They're jobs that have got to be done fast, efficiently, economically. Here are the 1941 Ford Trucks that are built to meet these present-day dimensions for dollar-saving dependability.

They "have everything." Choice of power. Range of wheelbases. Wide range of body and chassis types. And the kind of economy that really counts — *over-all* economy.

The 95-hp Ford V-8 engine has an extra margin of horsepower not offered in any other low-price truck, and sells at several hundred dollars less than any other truck with equal horsepower rating. The 95-hp engine is teamed up with the famous Ford 85-hp engine that has proved its dependability and economy in billions of miles of payload performance.

There's new styling and there are many new improvements and refinements. Above all, there is the down-to-earth quality and economy that have made Ford V-8 a symbol of dollar-saving performance in nearly every kind of hauling and delivery work.

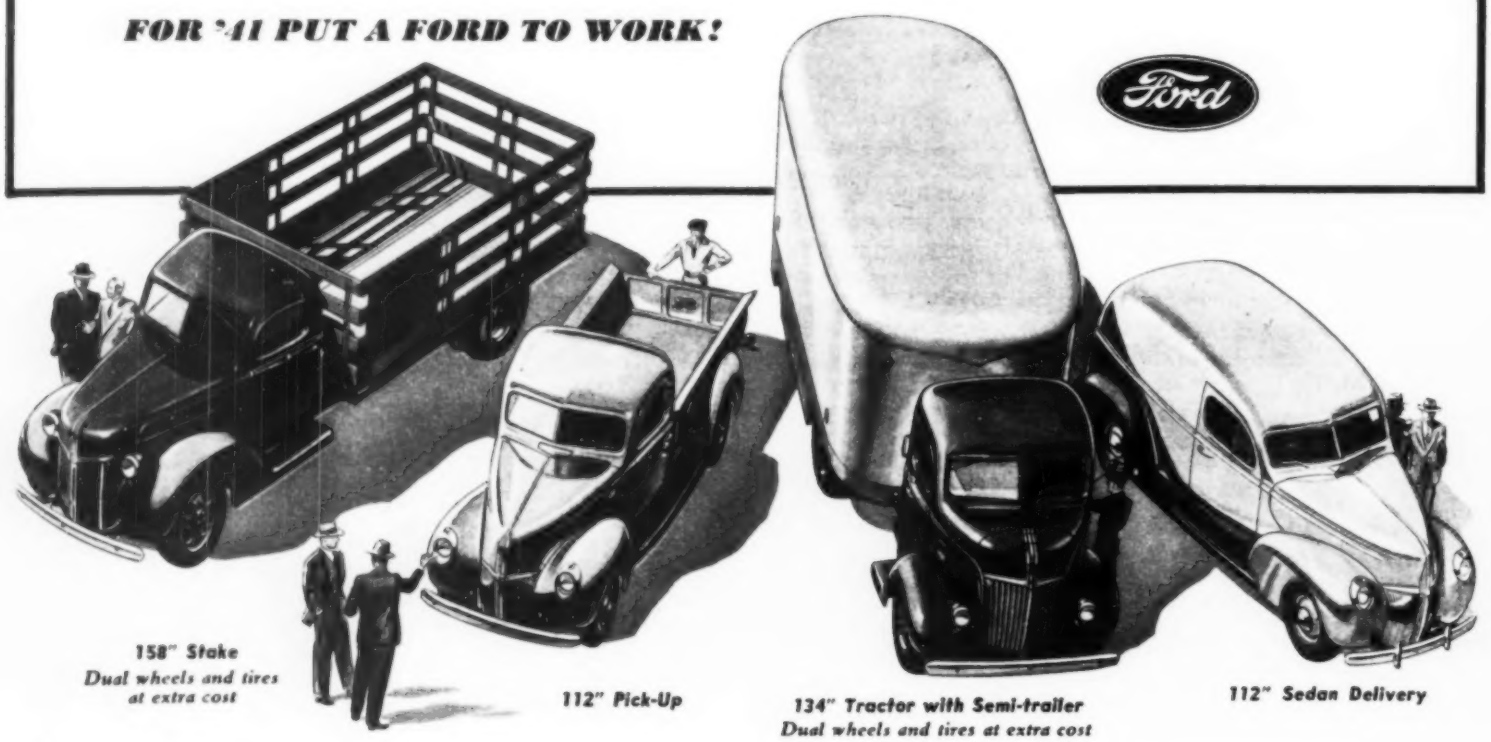
See the Ford V-8 Truck at your Ford dealer's. Put one to work on your job and test it your own way. Prove to yourself that this is the unit to do your job, in less time, at lower cost.

1941 FORD FEATURES

Two V-8 engines — 95 and 85 hp ★ New 4-cylinder 30-hp engine for maximum economy in Commercial Cars, ¾ and One-Ton Trucks ★ Six wheelbases — 42 body and chassis types ★ Full-floating rear axles in all trucks — ring gear thrust plate ★ ¾-floating axle in Commercial Cars ★ Straddle-mounted driving pinion ★ Big hydraulic brakes ★ Two-speed axle as well as reinforced frame in trucks for heavy-duty service are optional at extra cost.

Ford Motor Company, builders of Ford V-8 and Mercury Cars, Ford Trucks, Commercial Cars, Station Wagons and Transit Buses

FOR '41 PUT A FORD TO WORK!



158" Stake
Dual wheels and tires at extra cost

112" Pick-Up

134" Tractor with Semi-trailer
Dual wheels and tires at extra cost

112" Sedan Delivery

YOU'LL GET A LOWER NET COST PER YARD

STANDARDIZING on LeTOURNEAU

For short hauls and small jobs — smaller Carryalls. Here an LS (11 yards heaped) on Michigan road job.

For the short push . . . clearing and pioneering under difficult conditions . . . use LeTourneau 'Dozers.

For bigger yardages and longer hauls—big capacity Carryalls. Here two double-bucket RU's (30 heaped yards) on California levee job.

To make "scraper dirt" out of rocky material . . . to eliminate blasting costs and dangers . . . use a Rooter.

For compacting fills . . . LeTourneau Sheepsfoot Rollers in 2 and 4-drum sizes.

For shovel loading and truck hauling speeds . . . Tournatrailers, 10 to 30 yards capacity.

For lifting, carrying and spotting . . . LeTourneau Tractor Cranes.

For long hauls and faster earthmoving use Tournapulls. One of two C Tournapulls (11 yards heaped) on 6000-foot round trip haul in Arkansas.

COMPLETE LeTOURNEAU LINE . . . GIVES YOU RIGS TO HANDLE ALL TYPES OF EARTHMOVING JOBS AND CONDITIONS

Here's How You Save . . .

On Power—Your power source—a tractor—is never tied down to one piece of equipment. Equipped with a LeTourneau Power Control Unit, it will operate any LeTourneau rig—'Dozer, Carryall Scraper, Rooter, Tournatrailer, Crane. Change from one rig to another is easily and quickly made.

Breaking in Operators—Because a standard Power Control Unit controls all LeTourneau rigs, new men quickly get the hang of operating, can change from one rig to another without long break-in periods.

On Parts and Service—Many parts are interchangeable. Most repairs are easily made with a portable welder. Time losses are cut to a minimum because parts and service are available from any LeTourneau-"Caterpillar" dealer—more than 100 in the United States.

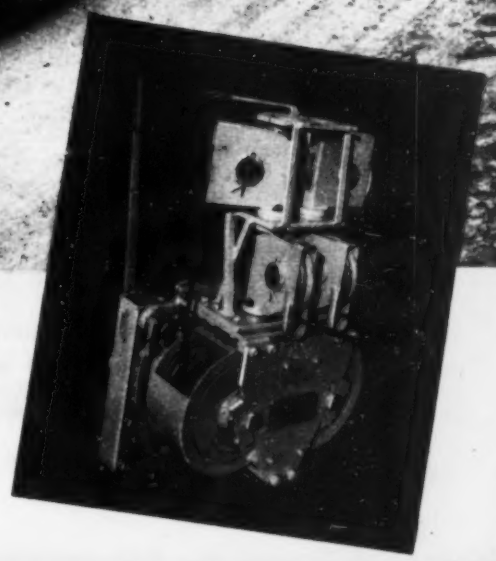
On Equipment Investment—Interchangeability reduces number of tractors required. Ability of Carryalls to load, haul, and spread eliminates need for special loading and spreading equipment. You save on initial investment, insurance, taxes and depreciation.

Check these savings. Ask your dealer to show you NOW . . . on your job . . . how LeTourneau equipment simplifies operating problems and puts extra profits in your pocket.

LE TOURNEAU

PEORIA, ILLINOIS • STOCKTON, CALIFORNIA

For Lowest Net Cost per Yard-CARRYALL* SCRAPERS, ANGLEDOZERS*, CRANES, BULLDOZERS, POWER CONTROL UNITS, DRAG SCRAPERS, PUSHDOZERS, SHEEP'S FOOT ROLLERS, ROOTERS*, TREEDOZERS, TOURNAPULLS*, TOURNATRAILERS*. *Name Reg. U. S. Pat. Off.



One method of Control for all units . . . the fast-acting LeTourneau Power Control Unit.

BETTERS MILEAGE ABOUT TWO MILES PER GALLON FOR TRUCK OPERATOR

Two miles more per gallon should interest any fleet operator, but that isn't all that interests a Standard Automotive Engineer when he starts checking your fleet. For instance, the Carney Company at Mankato, Minn., where this saving was made, was having bearing trouble. The Standard Automotive Engineer, working with the fleet maintenance men, made the usual thorough tests with his instruments and recommended a change in motor oil. When the work was finished, in addition to the average increase of 2 miles per gallon, they found that these trucks now run over 100,000 miles without any bearing trouble, where previously bearings had failed at 15,000 miles.

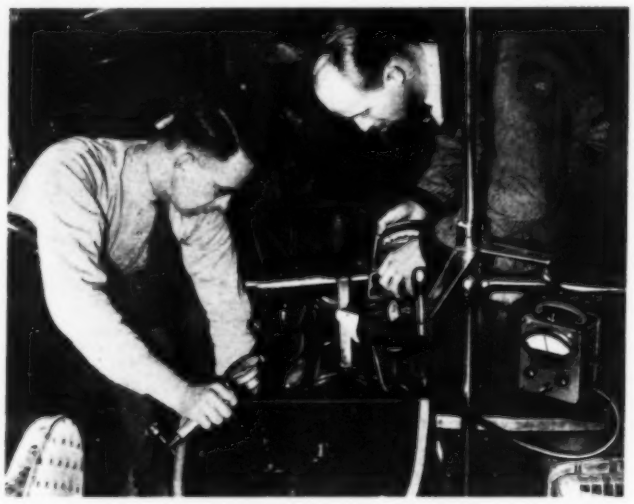
There are many ways in which a Standard Automotive Engineer can help you. He can tell you what fuels and lubricants are best for your particular fleet, what causes certain high maintenance items, and from his own experience he can tell you how these recommendations have saved money for other fleets.

HERE'S WHERE YOU'LL FIND YOUR STANDARD AUTOMOTIVE ENGINEER...

Billings, Montana
Chicago, Illinois
Davenport, Iowa
Decatur, Illinois
Denver, Colorado
Des Moines, Iowa
Detroit, Michigan
Duluth, Minnesota
Evansville, Indiana
Fargo, North Dakota
Grand Rapids, Michigan
Green Bay, Wisconsin
Huron, South Dakota
Indianapolis, Indiana
Joliet, Illinois
Kansas City, Missouri
LaCrosse, Wisconsin
Mankato, Minnesota
Mason City, Iowa
Milwaukee, Wisconsin
Minneapolis, Minn.
Peoria, Illinois
Quincy, Illinois
Saginaw, Michigan
St. Joseph, Missouri
St. Louis, Missouri
South Bend, Indiana
Wichita, Kansas

BUS COMPANY SHARPLY REDUCES DRIVE SHAFT BEARING MAINTENANCE

Here is a typical example of how Standard Automotive Engineering Service works. A North Dakota bus company has used this service for the past year and a half. During this time a sludge problem was solved. Periodic tests of combustion efficiency have increased gasoline mileage 16%. Recently the fleet maintenance men and the Engineer tackled the problem of high



maintenance costs on drive-line bearings. When they had finished, bearing expense was reduced 75%.

Remember, this Engineering Service is not offered as a "one time shot" to get you to use Standard Oil products. These engineers are always available to advise you on any fleet problem or help you chase down trouble. Get to know *your* Standard Oil Engineer. His help costs you nothing, may save you much!

WHEEL BEARING LIFE INCREASED FOUR-FOLD IN COUNTY TRUCKS

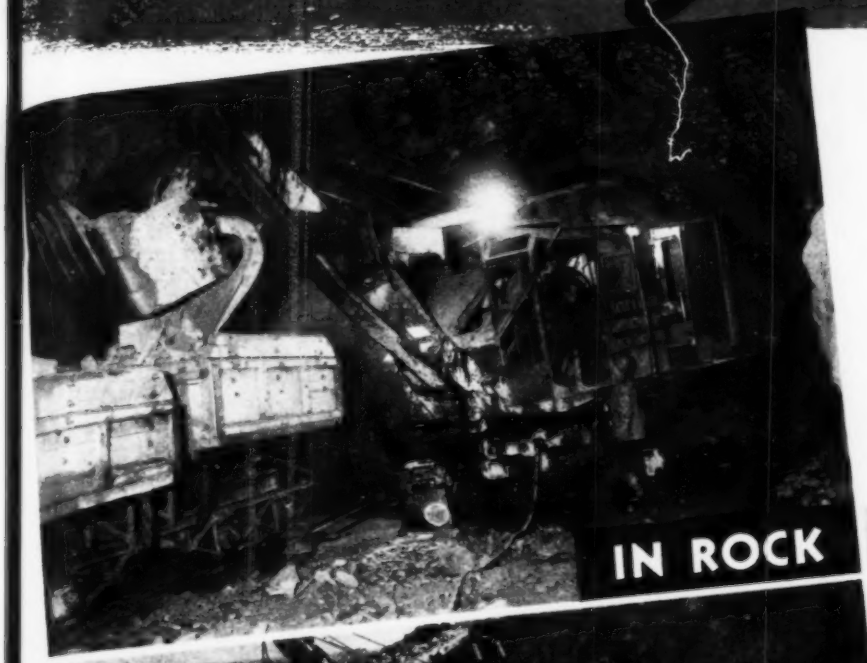
Wheel bearings in two road oil distributors operated by a Wisconsin county were failing about every 15,000 miles. That was before the maintenance man and the Standard Automotive Engineer got together to find the reason. After inspecting the bearings, the Engineer recommended the right grade of Standard Wheel Bearing grease. The bearings were cleaned and repacked. Now these trucks have gone 60,000 miles without bearing trouble.

Why not have one of these Engineers explain fully just what he does to help make these savings? A card to your local Standard Oil (Indiana) office or to 910 South Michigan Avenue, Chicago, Illinois, will reach the engineer you want. In Nebraska, call or write Standard Oil Company of Nebraska at Omaha. Just say, "We'd like to have your Standard Automotive Engineer call."

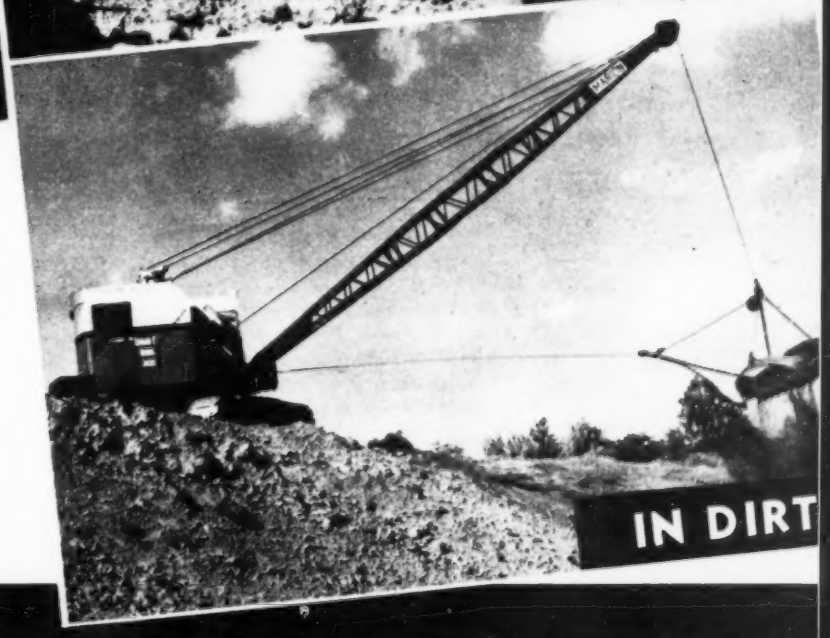
STANDARD OIL COMPANY (INDIANA)

AUTOMOTIVE ENGINEERING SERVICE — LOWERS MILEAGE COSTS

powerful DIGGERS



It is a well known fact . . . MARION machines have the power and stamina plus sturdy construction to break records in the toughest kind of digging . . . and to do it with ease, speed and low operating cost. Buy a machine built for rock. You know it will take care of other materials. In other words . . . buy a MARION.



Write - FOR BULLETIN DESCRIBING THE SIZE AND TYPE OF MACHINE IN WHICH YOU ARE PARTICULARLY INTERESTED...

THE MARION STEAM SHOVEL COMPANY
MARION, OHIO, U. S. A.

MODERNIZE with

MARION

SHOVELS • DRAGLINES • CLAMSHELLS • CRANES
PULL-SHOVELS • WALKERS from 3/4 cu. yd. to 35 cu. yds. Gasoline-Diesel-Electric

LOOK UNDER THE HIDE WHEN YOU BUY *Horsepower*

SHAPELY form and well-groomed coat look fine in a thoroughbred. But proper muscular development, sound wind and good training bring home the bacon!

It's *performance* that counts — in *any* kind of "horsepower." In "Caterpillar" Diesel Engines it is performance in OPERATING ECONOMY . . . in DEPENDABILITY for an unfaltering race against time . . . in STAMINA for a long grind . . . and in DURABILITY for a long life of usefulness.

These great qualities are in-built through years of steady "Caterpillar" engineering and manufacturing advancements.

"Look under the hide" when you buy engine power—or when specifying the engines you want in your powered equipment. Check these "Caterpillar" Diesel features toward engine value and profit-making performance:

1. ***Simplicity*** — no frequent nor delicate adjustments required.
2. ***Sound design*** — proved by many extraordinary records of operation on the world's toughest power jobs.
3. ***Exclusive fuel system*** — no operating adjustments; burns fuel cleanly and economically at *all* loads and speeds; operates efficiently on a wide range of fuels — including No. 3 furnace oil.
4. ***Removable cylinder liners*** — of wet type for best cooling.
5. ***Super-finished crankshaft*** — provides more accurate and longer lasting initial fit between bearings and journals as compared to journals having only ordinary ground finish.
6. ***Force-feed lubrication.***
7. ***Select steels*** to provide extra strength; heat-treatment to provide extra wear resistance.
8. ***Efficient cooling*** — through large-capacity cooling system equipped with thermostats and water by-pass for automatically keeping engine at correct operating temperature.
9. ***Sealed at all points*** to exclude dust and dirt.
10. ***Backed by the world's most complete and readily available engine parts and service facilities.***

CATERPILLAR TRACTOR CO. • PEORIA, ILLINOIS

CATERPILLAR

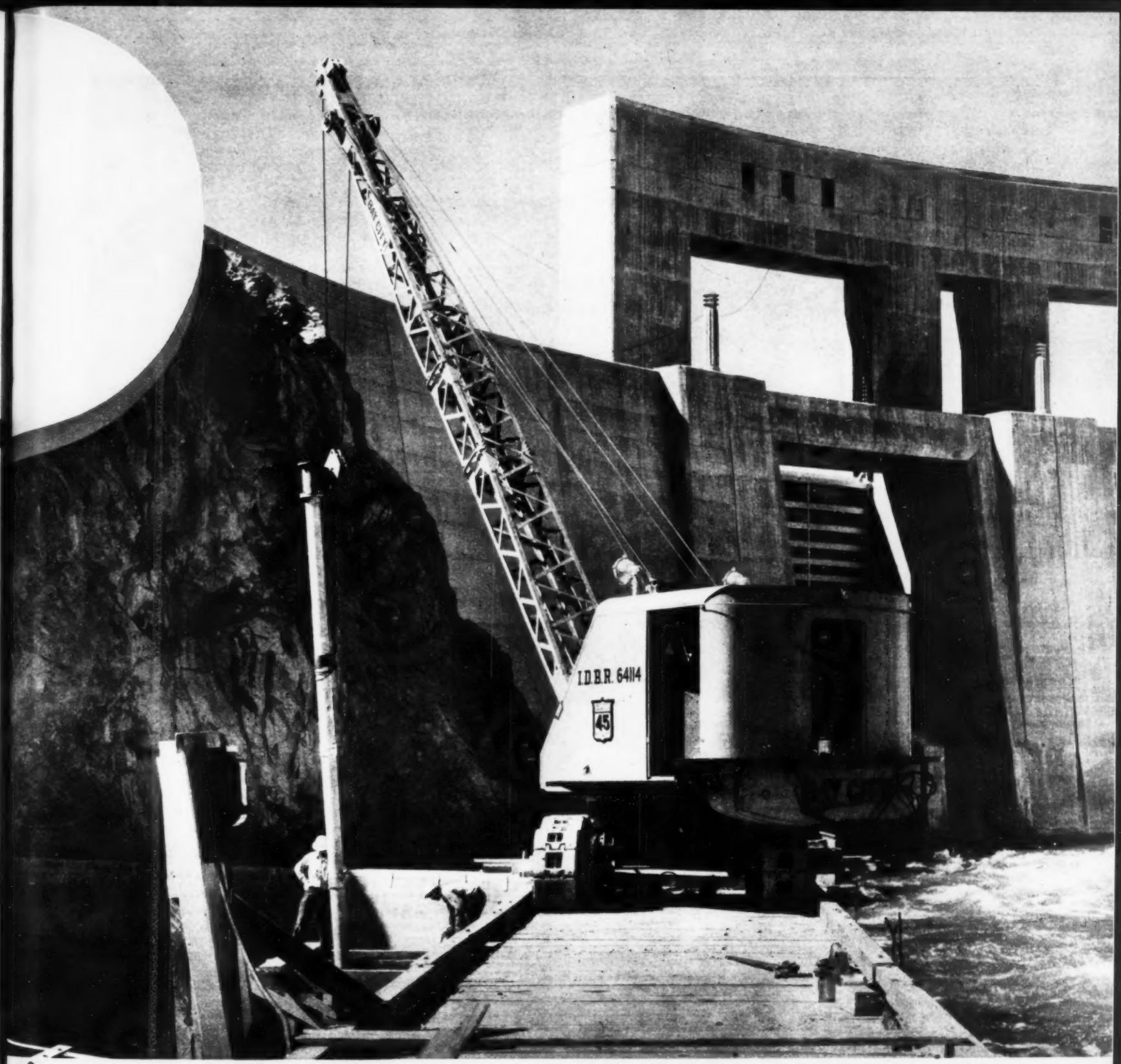
REG. U.S. PAT. OFF.

DIESEL ENGINES AND ELECTRIC SETS

TRACK-TYPE TRACTORS • ROAD MACHINERY

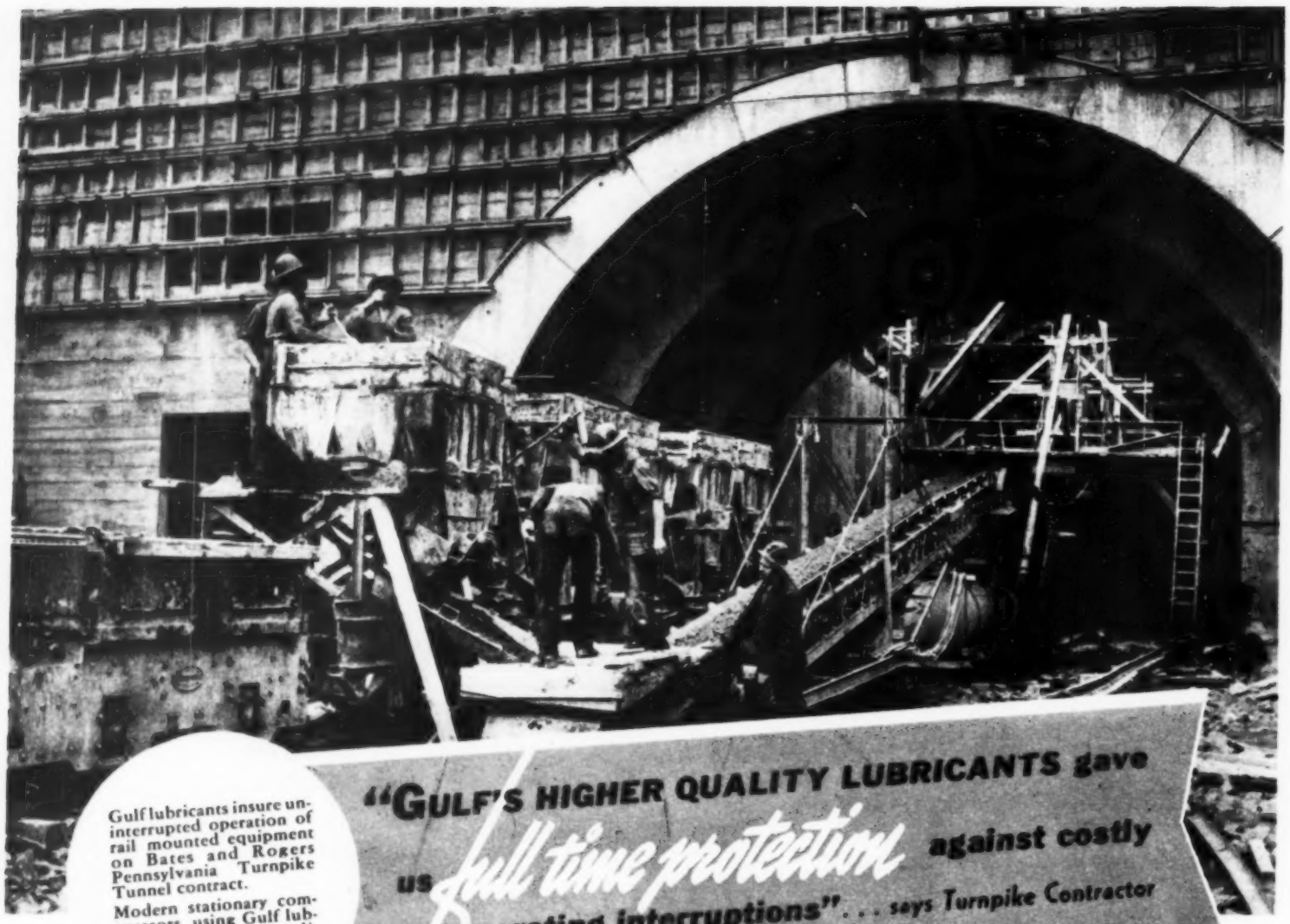
Says James E. Bryan, contractor: *"I've been pumping sand 20 years, and this combination has proved, by a tremendous percentage, to be the most satisfactory and economical I have yet used. Expense of operating my 'Caterpillar' Diesel is so cheap that it is unbelievable."*

DREDGES get the mud or sand out fast when "Caterpillar" Diesel Engines get behind the job. Sand dredge in picture below handles 850 tons per 10-hour day with a "Caterpillar" D13000 driving 6-inch sand pump on 5 gallons of 7½c fuel per hour. This outfit is located about 3½ miles from Goldsboro, North Carolina.



SHOVELS, CRANES, DRAGLINES, DITCHERS usually keep up with, or ahead of, schedules when powered with rugged, dependable "Caterpillar" Diesel Engines. Picture shows a Bay City 45, powered with a "Caterpillar" D8800, working as a material-handling crane during power-house construction on the Parker Dam (Calif.) project.

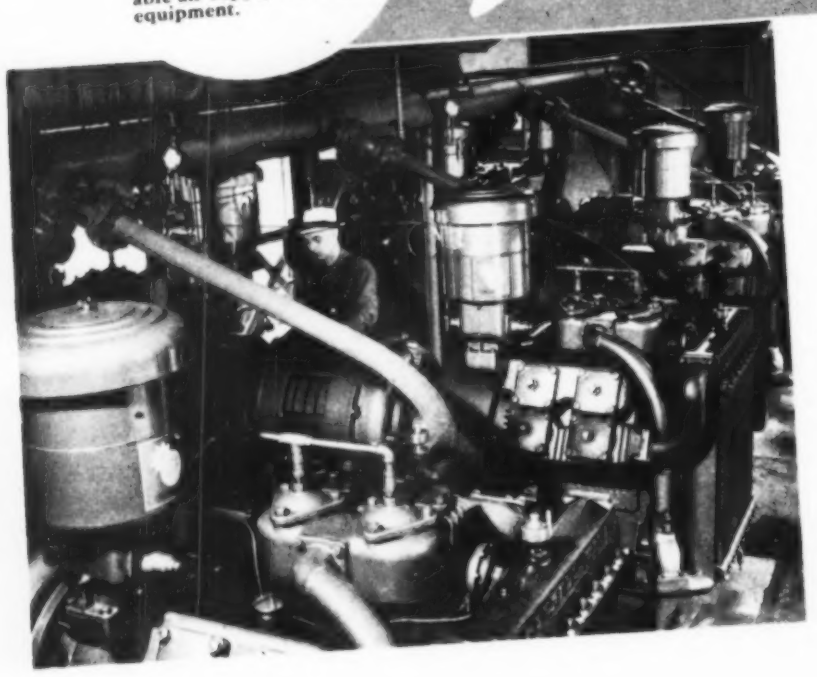
COMPRESSORS' variable loads are readily met with the flexible power of "Caterpillar" Diesel Engines. Illustrated is a "Caterpillar" D13000 operating truck-mounted LeRoi-Rix compressor for three jack hammers. Job: drilling peg holes for header boards in preparation for laying black-top center strip. Griffith Co., Los Angeles, California.



Gulf lubricants insure uninterrupted operation of rail mounted equipment on Bates and Rogers Pennsylvania Turnpike Tunnel contract.

Modern stationary compressors, using Gulf lubricants, provide a reliable air supply to tunnel equipment.

"GULF'S HIGHER QUALITY LUBRICANTS gave us *full time protection* against costly operating interruptions" . . . says Turnpike Contractor



"Thanks to the Gulf Engineer . . . His recommendations gave us the benefit of High Lubricating Efficiency"

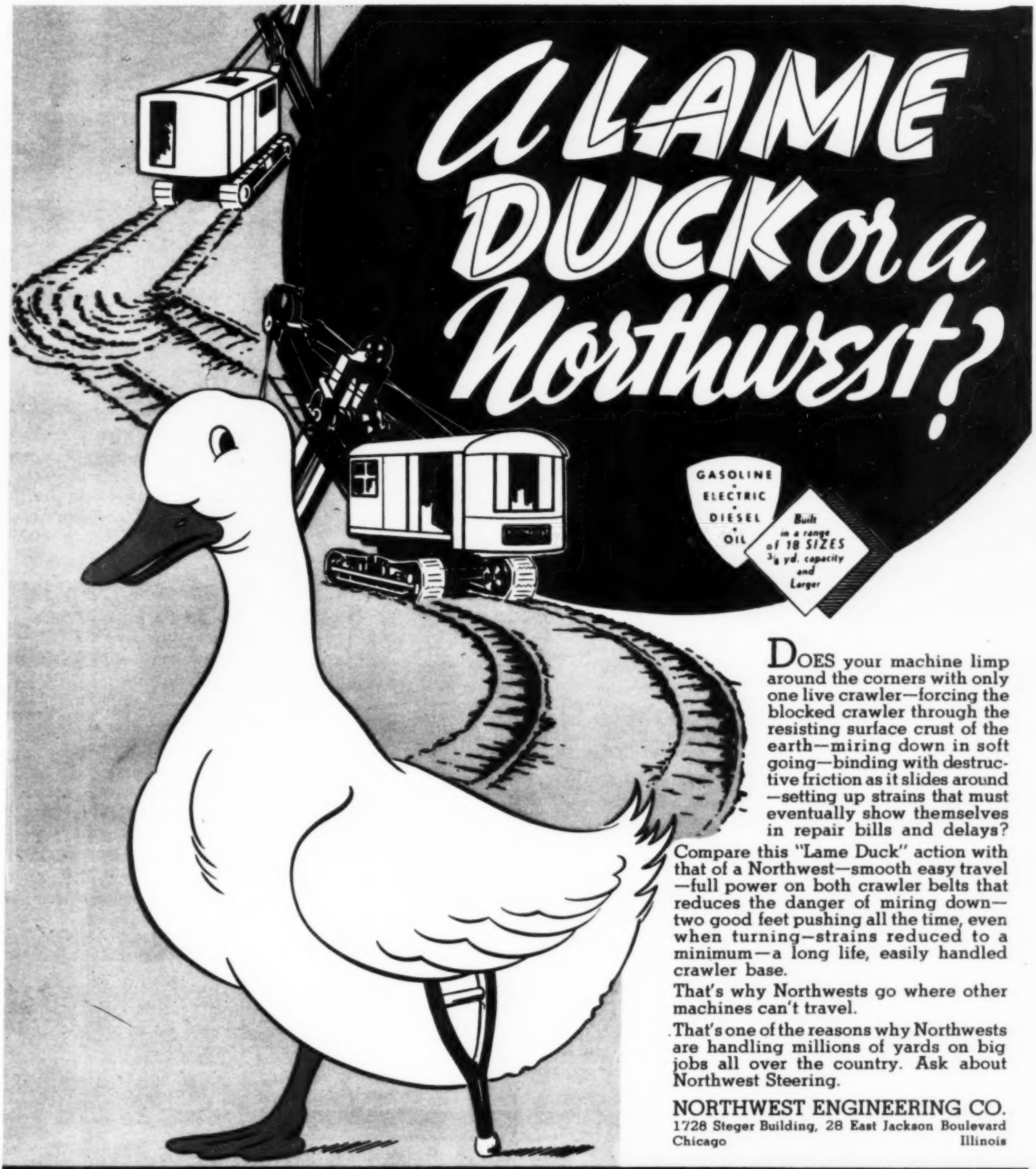
"OUR Turnpike job was completed without operating difficulties — thanks to Gulf's high quality lubricants," says this Turnpike Contractor. "The Gulf engineer recommended improved lubrication practice that gave us an extra margin of operating efficiency."

Are you seeking more economical operation and better productivity from your equipment? You will benefit by Gulf Periodic Consultation Service—and the higher performance value of Gulf quality lubricants. In the Gulf line of more than 400 oils and greases there are exactly the lubricants your equipment needs — no matter what type it is.

Gulf's higher quality lubricants are quickly available through more than 1,100 warehouses in 30 states from Maine to New Mexico.

Bates and Rogers Construction Company of New York-Chicago-San Francisco, drilled the Kittatinny and Blue Mountain Tunnels — the only "twin" tunnels on the Pennsylvania Turnpike. This widely known contracting firm standardized on Gulf quality lubricants and fuels.

GULF



DOES your machine limp around the corners with only one live crawler—forcing the blocked crawler through the resisting surface crust of the earth—miring down in soft going—binding with destructive friction as it slides around—setting up strains that must eventually show themselves in repair bills and delays?

Compare this "Lame Duck" action with that of a Northwest—smooth easy travel—full power on both crawler belts that reduces the danger of miring down—two good feet pushing all the time, even when turning—strains reduced to a minimum—a long life, easily handled crawler base.

That's why Northwests go where other machines can't travel.

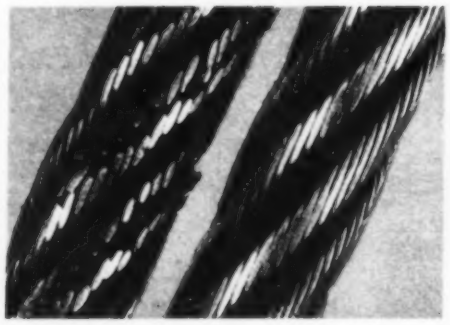
That's one of the reasons why Northwests are handling millions of yards on big jobs all over the country. Ask about Northwest Steering.

NORTHWEST ENGINEERING CO.
1728 Steger Building, 28 East Jackson Boulevard
Chicago Illinois

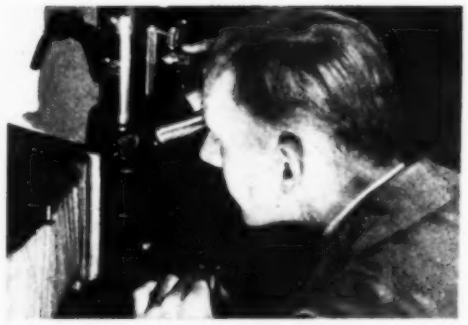
NORTHWEST

SHOVELS · CRANES · DRAGLINES · PULLSHOVELS · SKIMMERS

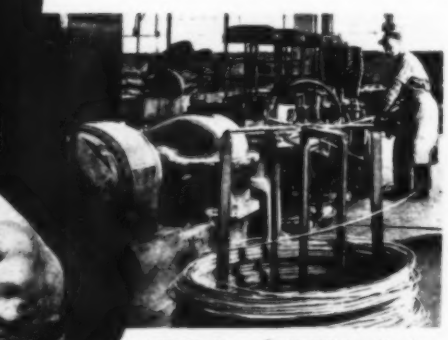
"The BETTER it's tailored the LONGER it wears!"



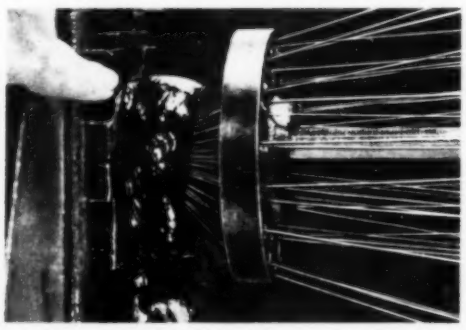
If you keep performance records on both ordinary wire rope and Macwhyte Steel-tailored rope, you'll actually SEE (as you can here): how Macwhyte steel-tailored rope outlasts ordinary rope by a *wide* margin. Let me show you why:



FIRST, there's DESIGN Tailoring. Macwhyte men are *specialists* with years of experience in the laboratory . . . the ropes they make are designed to meet your *specific* problems. That's why Macwhyte Ropes LAST so long, why they're so profitable to use.



THEN there's STEEL Tailoring. The steel used in Macwhyte ropes is not ordinary steel. And every process through which it goes... laboratory tests, heat-treating, baking, wire drawing . . . is done with hair-line accuracy by master workmen.



FINALLY, there's PERFECT FITTING — exact, synchronized strand FITS PERFECTLY and is FULLY PROTECTED in the finished rope by special Macwhyte lubricant, specially designed to ward off corrosion and internal friction.

BUT THAT ISN'T ALL! Macwhyte engineers the year 'round check performance on *all* kinds of jobs. They find out what rope does best on a specific job. That's why they can recommend for your specific job a rope designed, made, and field-proved to give you maximum service. In short, Macwhyte wire rope is "steel-tailored" to give you longer wear at considerably less cost. Try it.

NO. 442A

MACWHYTE COMPANY

Kenosha, Wisconsin, Manufacturers of Wire Ropes and Braided Wire Rope Slings for every use. (Distributors throughout the U. S. A.) New York... Pittsburgh . . . Chicago . . . Ft. Worth ...Portland...Seattle...San Francisco.

MACWHYTE

Whyte Strand

PREformed WIRE ROPE

The Wire Rope with THE Internal Lubrication

LABORATORY TESTED—FIELD PROVED

From a Famous Line of Money-Makers

LaPlant-Choate Carrimor Scrapers & Bulldozers

★ *A Complete Package—from One Source for Practically all Earth-Moving Operations*

VERSATILITY — greater capacity — economy of operation make LaPlant-Choate tools outstanding on any job. When the job requires such earth-moving operations as digging, pushing, hauling, dumping and the like, two units that have won the position of universal favorites are LaPlant-Choate Carrimor Scrapers and LaPlant-Choate Bulldozers.

These two units can be easily classed as a complete package because the Bulldozer can remain mounted on the front of your "Caterpillar" Track type Tractor without interfering in any way with the operation of the Carrimor Scraper attached on the rear.

The LaPlant-Choate Bulldozer digs, pushes, levels, fills, grades, uproots stumps and performs many other duties quickly, dependably, and economically. The famous Carrimor handles all scraper operations and because it has no overhead obstructions, it can be loaded direct from a shovel to haul and dump material without resorting to extra hauling equipment.

Among the jobs for which these LaPlant-Choate tools are ideal is airport construction and maintenance work. Many such jobs are now underway and indications point to increased activity in this field.

Modernize your equipment now with time-saving, cost-cutting LaPlant-Choate equipment.

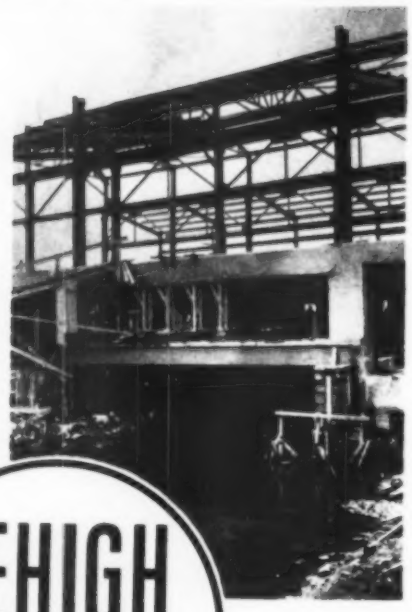
The Complete
La Plant-Choate Line

- **TRAILBUILDERS** with Hydraulic Control or Cable Control
- **BRUSH CUTTERS**
- **ROOT CUTTERS**
- **RAKE TYPE BLADES**
- **STUMP SPLITTERS**
- **TREEDOZERS**
- **RIPPERS**
- **CARRIMOR SCRAPERS** 4 sizes forced ejection type; 2 sizes rear dumping type
- **BULLDOZERS** with Hydraulic or Cable Control Units
- **SHEEPFOOT TAMPERS**
- **SNOW PLOWS**

● LaPlant-Choate equipment is designed exclusively for use with "Caterpillar" Track Type Tractors; thus assuring a perfectly balanced, highly coordinated unit as well as readily available service facilities. Get full details today from your LaPlant-Choate and "Caterpillar" dealer.

LA PLANT-CHOATE MANUFACTURING CO. Inc.
CEDAR RAPIDS, IOWA.

Answering the call— *to Arm*



NOW—America's urgent call is—HURRY! Armament, tools, construction of increased facilities for output—all are needed at top speed. "TIME SAVING" has an added meaning—quicker preparedness. Men and materials that can perform their tasks quickly and well take on added importance and values.

Typical of the American construction Industry's ability to meet the demand for construction speed is the quick completion of this plant addition for the Bullard Co. at Bridgeport, Conn., where heavy tools are made. The Turner Construction Company delivered 40% of the new building ready for occupancy in 46 days—the entire plant in 70 days. And at normal costs, working on a regular 40-hour week construction schedule.

Typical of Lehigh Early Strength Cement's every-day performance in meeting the demand for speed are the results obtained by its use in the heavy floor slabs up to 14-inch thickness and designed to carry live loads up to 800 lbs. per sq. ft. Because it made quick service strength concrete, steel erection followed the "pour" for each floor section within 72 hours, and, in some cases, 24 hours. Forms were quickly removed for re-use. Much of the shoring needed because of marshy ground was eliminated entirely.

You can get this relative speed in any concrete work by using Lehigh Early Strength Cement. It will save time. It often reduces construction costs. The Lehigh Service Department will gladly answer your inquiries.

LEHIGH EARLY STRENGTH CEMENT

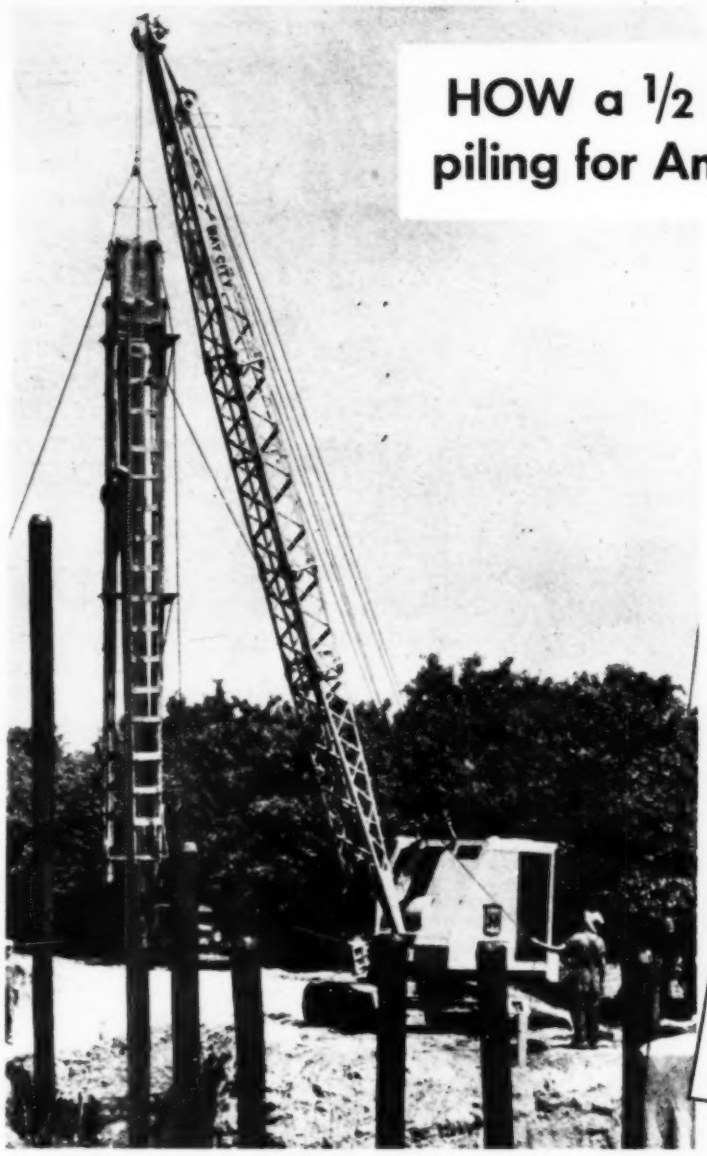
FOUNDRY EXTENSION, The Bullard Company, Bridgeport, Conn.

ENGINEER: Alexander D. Crosett, New York.

CONTRACTOR: Turner Construction Co., New York, E. A. Courter, Supt.

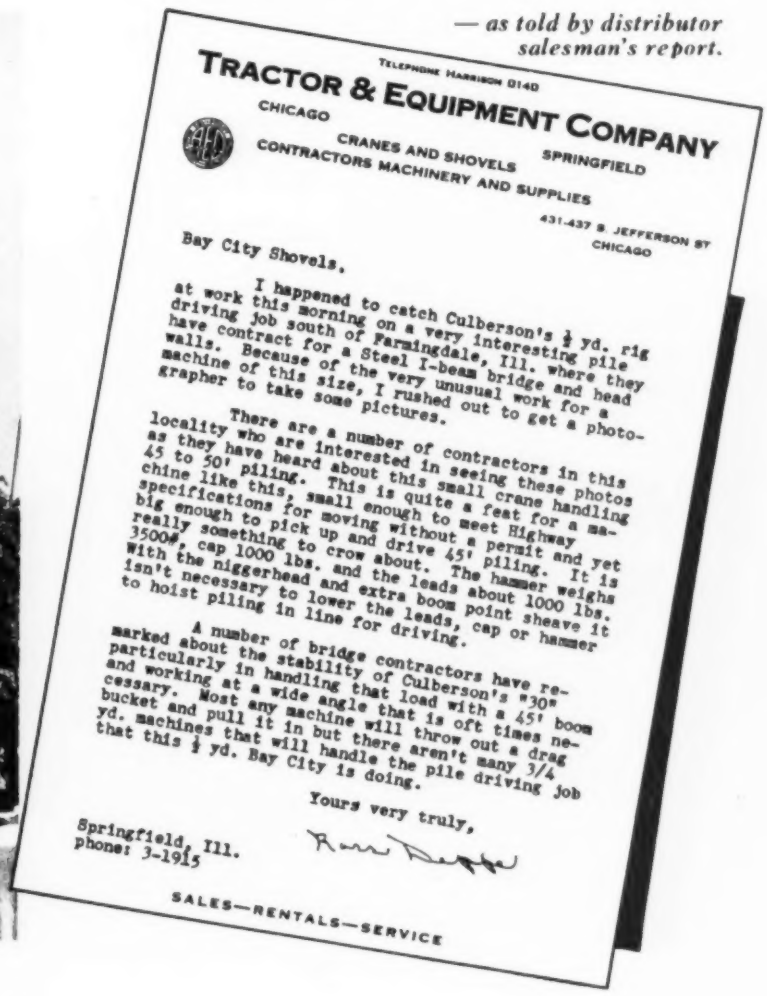
LEHIGH PORTLAND CEMENT COMPANY

Allentown, Pa., Chicago, Ill., Spokane, Wash.



HOW a ½ yd. BAY CITY handles 45′ to 50′ piling for Amos Culberson & Sons, Pana, Ill.—

— as told by distributor salesman's report.



TELEPHONE HARRISON 0140

TRACTOR & EQUIPMENT COMPANY

CHICAGO — SPRINGFIELD

CRANES AND SHOVELS
CONTRACTORS MACHINERY AND SUPPLIES

431-437 S. JEFFERSON ST
CHICAGO

Bay City Shovels,

I happened to catch Culberson's ½ yd. rig at work this morning on a very interesting pile driving job south of Farmingdale, Ill. where they have contract for a Steel I-beam bridge and head walls. Because of the very unusual work for a machine of this size, I rushed out to get a photographer to take some pictures.

There are a number of contractors in this locality who are interested in seeing these photos as they have heard about this small crane handling 45 to 50′ piling. This is quite a feat for a machine like this, small enough to meet Highway specifications for moving without a permit and yet big enough to pick up and drive 45′ piling. It is really something to crow about. The hammer weighs 3500#, cap 1000 lbs. and the leads about 1000 lbs. With the niggerhead and extra boom point sheave it isn't necessary to lower the leads, cap or hammer to hoist piling in line for driving.

A number of bridge contractors have remarked about the stability of Culberson's "30" particularly in handling that load with a 45′ boom and working at a wide angle that is oft times necessary. Most any machine will throw out a drag bucket and pull it in but there aren't many 3/4 yd. machines that will handle the pile driving job that this ½ yd. Bay City is doing.

Yours very truly,

Springfield, Ill.
phone: 3-1915

SALES—RENTALS—SERVICE

Added STABILITY *is result of balanced design—*

On jobs like this you can handle bigger loads faster and more economically if your crane has maximum STABILITY — in other words, if it combines high crane safe rating with ease and speed of operation. It is here that the BAY CITY gives you more and bigger value in small machines from ⅜ to 1½ yard capacity.

From the ground up, STABILITY has been engineered into the balanced design of these fast, powerful, easy-to-operate and easily converted machines. The long, wide crawlers with sturdy axles; the unit-cast alloy steel heat treated bases; the tandem drums powered through helical gears; the boom foot lugs directly over the swing roller path all contribute to well balanced design.

There is no secret about added stability — it is a fundamental principle. It costs us more money to build machines with higher crane rating but they give you a bigger return in added performance — they enable you to handle jobs like Culberson's with a smaller rig than you might normally expect to use. Get the complete story by writing for Catalog H-2 containing 32 pages of pictures and data.

BAY CITY SHOVELS, INC., BAY CITY, MICHIGAN
Export Office: 330 W. 42nd St., New York City (OPARO)

BAY CITY

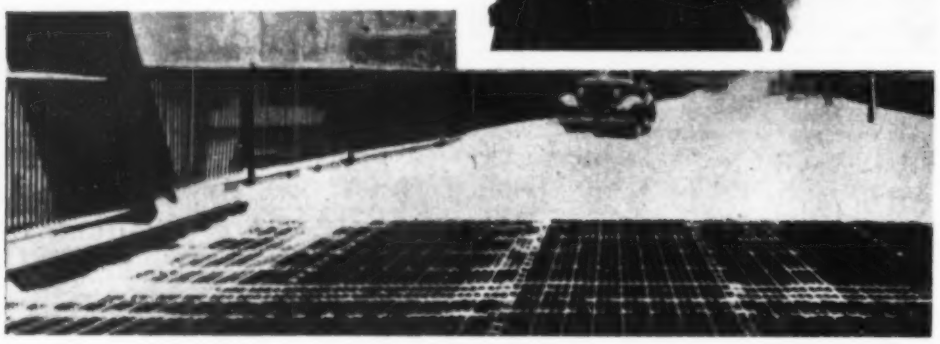
SHOVELS • CRANES • DRAGLINES • TRENCH-HOES • SKIMMERS

A Toll Bridge *can't afford* traffic tie-ups or detours

. . . so they refloored with I-Beam-Lok Open Flooring that's ready for business all year 'round!

TRAFFIC KEEPS FLOWING AS NEW FLOOR GOES DOWN. Take a tip from this toll bridge job. Crossing the Monongahela River at North Charleroi, Pa., this bridge floor required frequent and expensive maintenance. When replacement was necessary, the owners, The Mercantile Bridge Company, insisted on getting a new floor that would stand up . . . that would go down with least disturbance of traffic . . . and that would pay for itself in long service and low maintenance. They chose U·S·S I-Beam-Lok Open Flooring.

NO MORE NEED FOR THIS SIGN. The treaded surface of I-Beam-Lok Open Flooring makes driving safe, *always*. In skid tests, after ice had formed, a car driven at 35 m.p.h. came to a perfect stop when brakes were suddenly applied, only a slight skid forward in a straight line occurred—no side skid whatever.



HERE in a privately operated toll bridge, where every dollar invested for construction and upkeep must justify itself, the economic and structural advantages of U·S·S I-Beam-Lok Open Flooring are brought into sharp focus.

These money-saving and time-saving advantages include:

1. Light Weight. U·S·S I-Beam-Lok Open Floor weighs only 18.6 lbs. per sq. ft. The old floor on this bridge weighed approximately 49 lbs. per sq. ft., had a posted permissible capacity of 12 tons per vehicle. To reinforce the structure, 8" I-Beam purlins on 4' centers were laid on longitudinal stringers. Even with the purlins, the new open floor now weighs only 24 lbs. per sq. ft.—less than half the old construction, now has capacity for 20-ton vehicles.

2. Rapid Installation. I-Beam-Lok Open Flooring comes in large pre-fabricated units, 6' 2" wide, up to 49' long. On this bridge, units 32' long were used. Weighing less than 2500 lbs. each, they were easily handled by 5 men. Eighteen men completed the entire floor, 1000 ft. long, 22 ft. wide, in less than 75 working days.

3. Self Cleaning. Snow, dirt and dust simply fall through the large 1⅝" x 2¾" rectangular openings. In last winter's heaviest snow fall (see photograph lower left) while adjacent river crossings were snow blocked, this I-Beam-Lok Open Floor was clear of snow, doing business as usual. The snow covered approach section is now being replaced with I-Beam-Lok Open Flooring.

4. Fireproof. All-steel construction absolutely eliminates fire hazards.

5. Low Cost Maintenance. Made of superior corrosion resisting U·S·S Copper Steel, no section less than ¼" thick, this floor will last as long as the bridge. The only maintenance required is occasional cleaning and painting, easily done from the decking surface.

Our engineers will gladly discuss the economies and application of this truly modern bridge floor with you.

U·S·S I-BEAM-LOK *Open* FLOOR

"PUTS NEW LIFE INTO OLD BRIDGES"

CARNEGIE-ILLINOIS STEEL CORPORATION

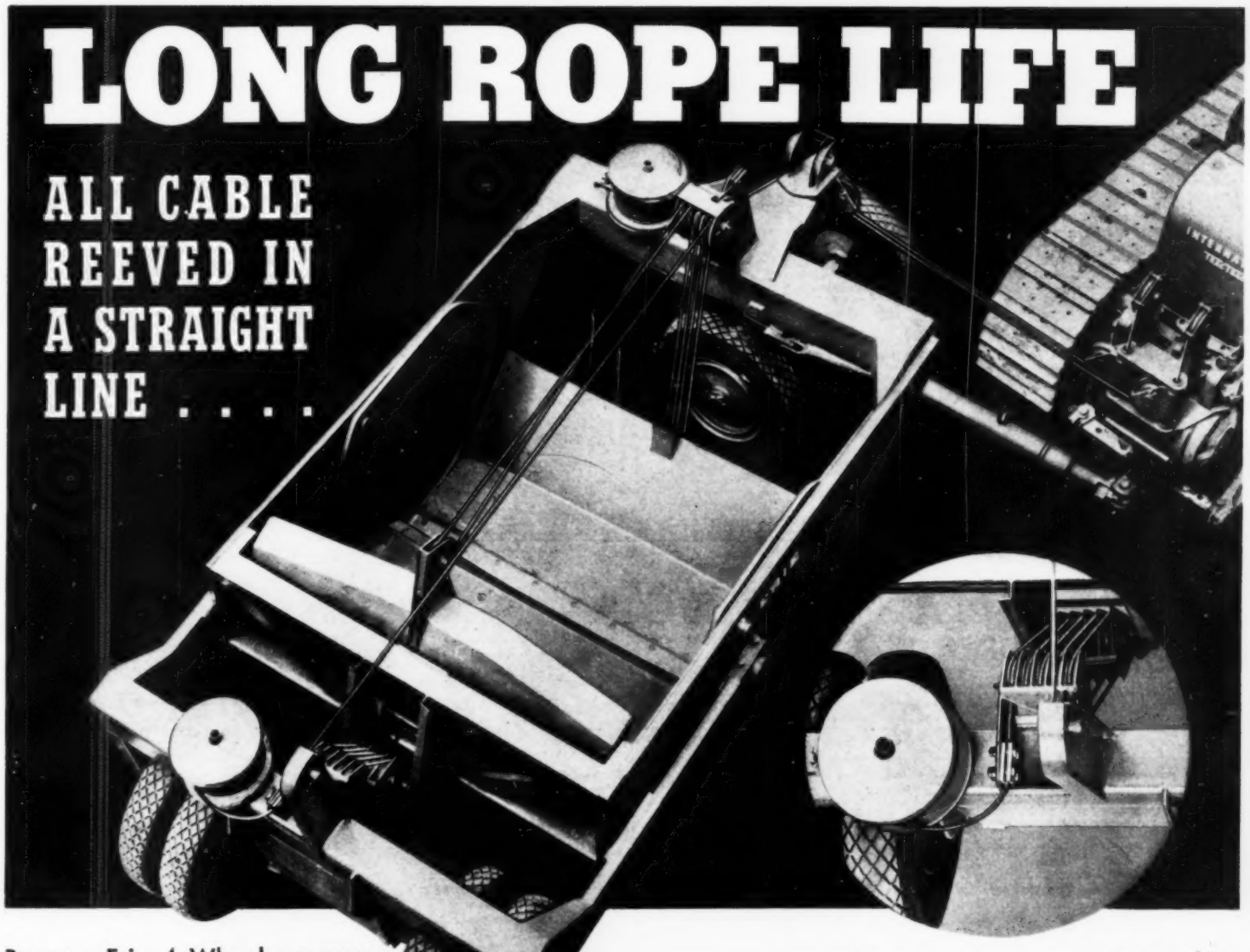
Pittsburgh and Chicago

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* · United States Steel Export Company, New York

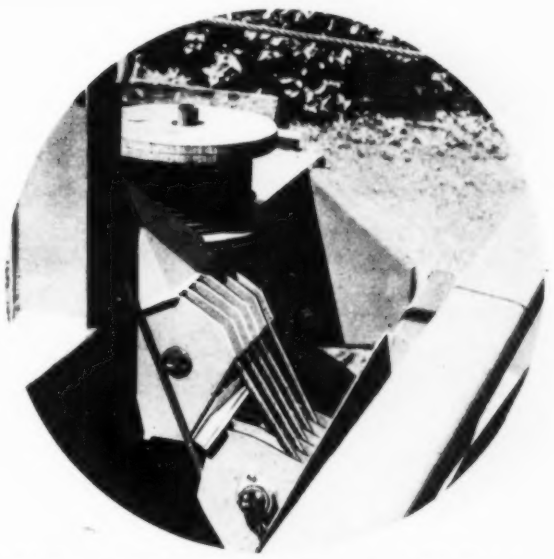
UNITED STATES STEEL

LONG ROPE LIFE

ALL CABLE REEVED IN A STRAIGHT LINE . . . .



Front and rear spindles carry reserve reels of cable easily fed in through non-pinching anchors. Cable is fed from anchors onto welded-in-place snubber spools.



A friction cushion between the rear tackle blocks provides for a slight overrun of the cable after the blocks are in contact, eliminating shock strains in the cable resulting from block to block contact.

Bucyrus-Erie 4-Wheel scrapers give you every feature you need for cheap dirt-moving. From control unit to rear wheels these scrapers are engineered to keep your costs down. There is rope cost for instance:

All cable is reeved so that there are no side bends, no damaging twists, and only a minimum number of reverse bends.

The sheaves are big; they're all vertical with horizontal axes; they're mounted on easy-rolling anti-friction bearings; on each model they're all the same size and interchangeable.

Self-aligning fairleads on scraper and control unit prevent fouling between the unit and scraper and eliminate lateral or vertical cable distortion.

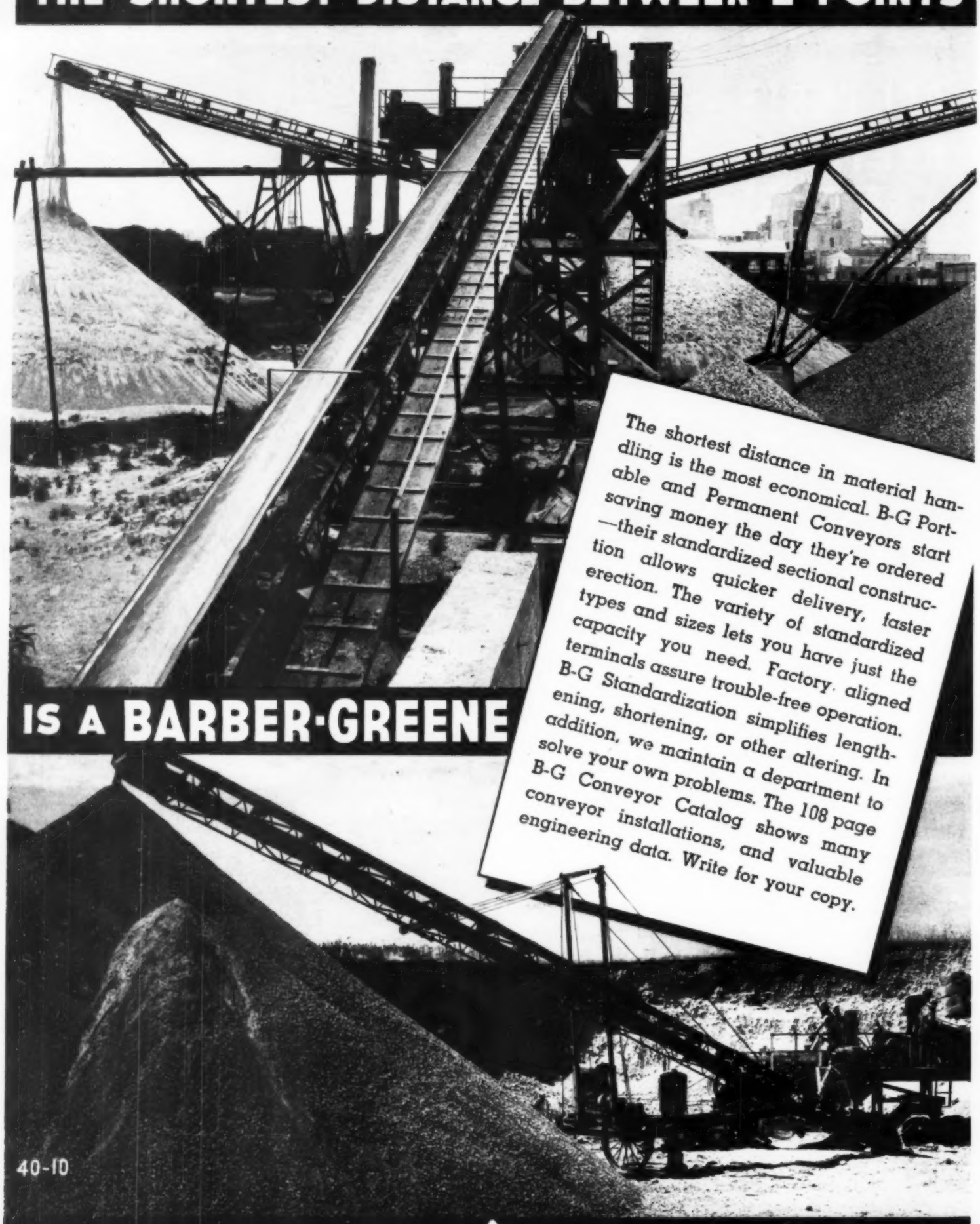
Wear occurs within a few feet of the control unit, where the cable is easy to watch, and where worn cable can be easily and economically removed.

Bucyrus-Erie 4-Wheel scrapers are easy on cable and keep rope costs low. This is one of many ways in which they will increase your dirt-moving profits. Get the complete story from your International TracTracTor distributor.

Bucyrus-Erie

SOUTH MILWAUKEE WISCONSIN

THE SHORTEST DISTANCE BETWEEN 2 POINTS



IS A BARBER-GREENE

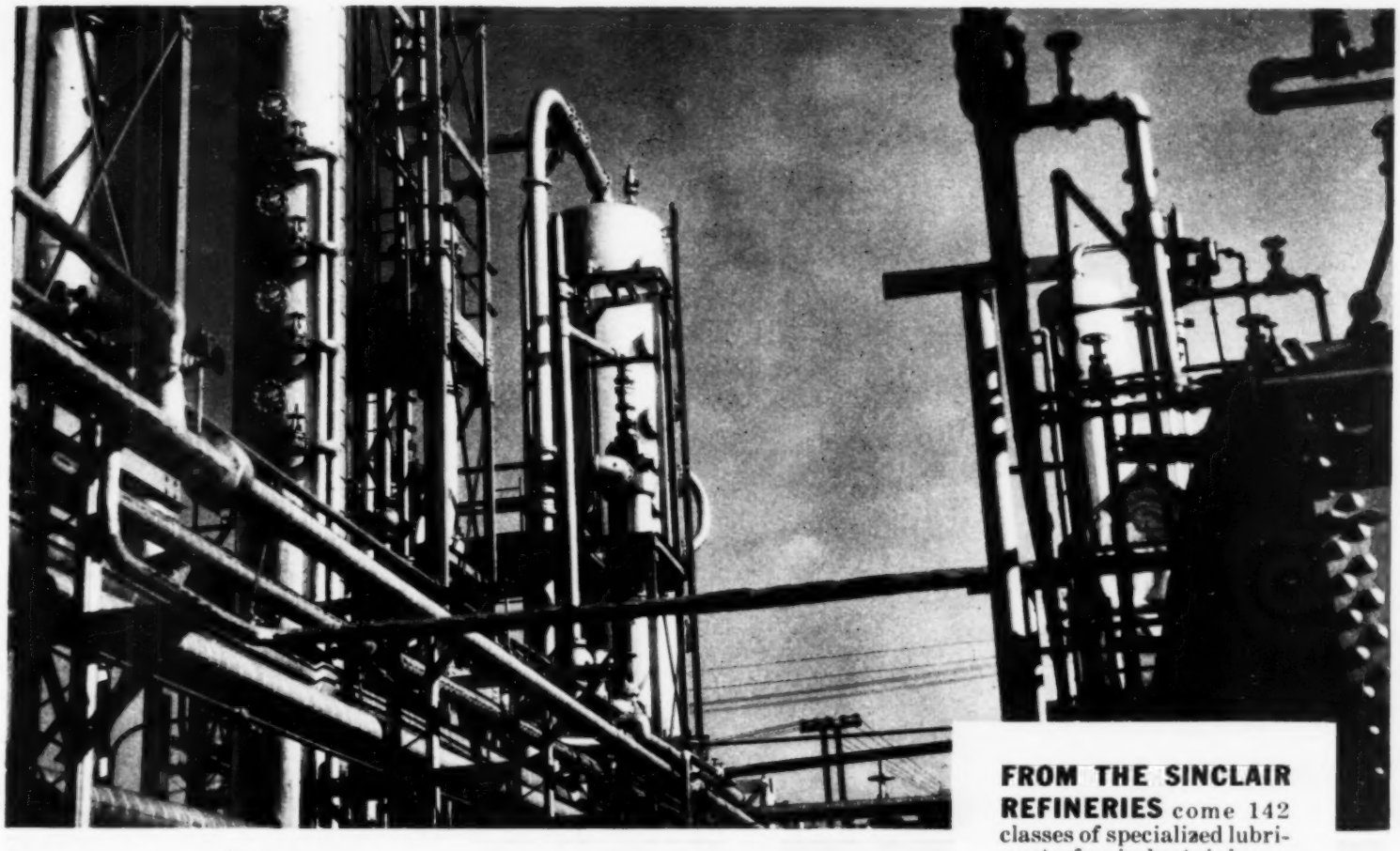
The shortest distance in material handling is the most economical. B-G Portable and Permanent Conveyors start saving money the day they're ordered —their standardized sectional construction allows quicker delivery, faster erection. The variety of standardized types and sizes lets you have just the capacity you need. Factory aligned terminals assure trouble-free operation. B-G Standardization simplifies lengthening, shortening, or other altering. In addition, we maintain a department to solve your own problems. The 108 page B-G Conveyor Catalog shows many conveyor installations, and valuable engineering data. Write for your copy.

40-10

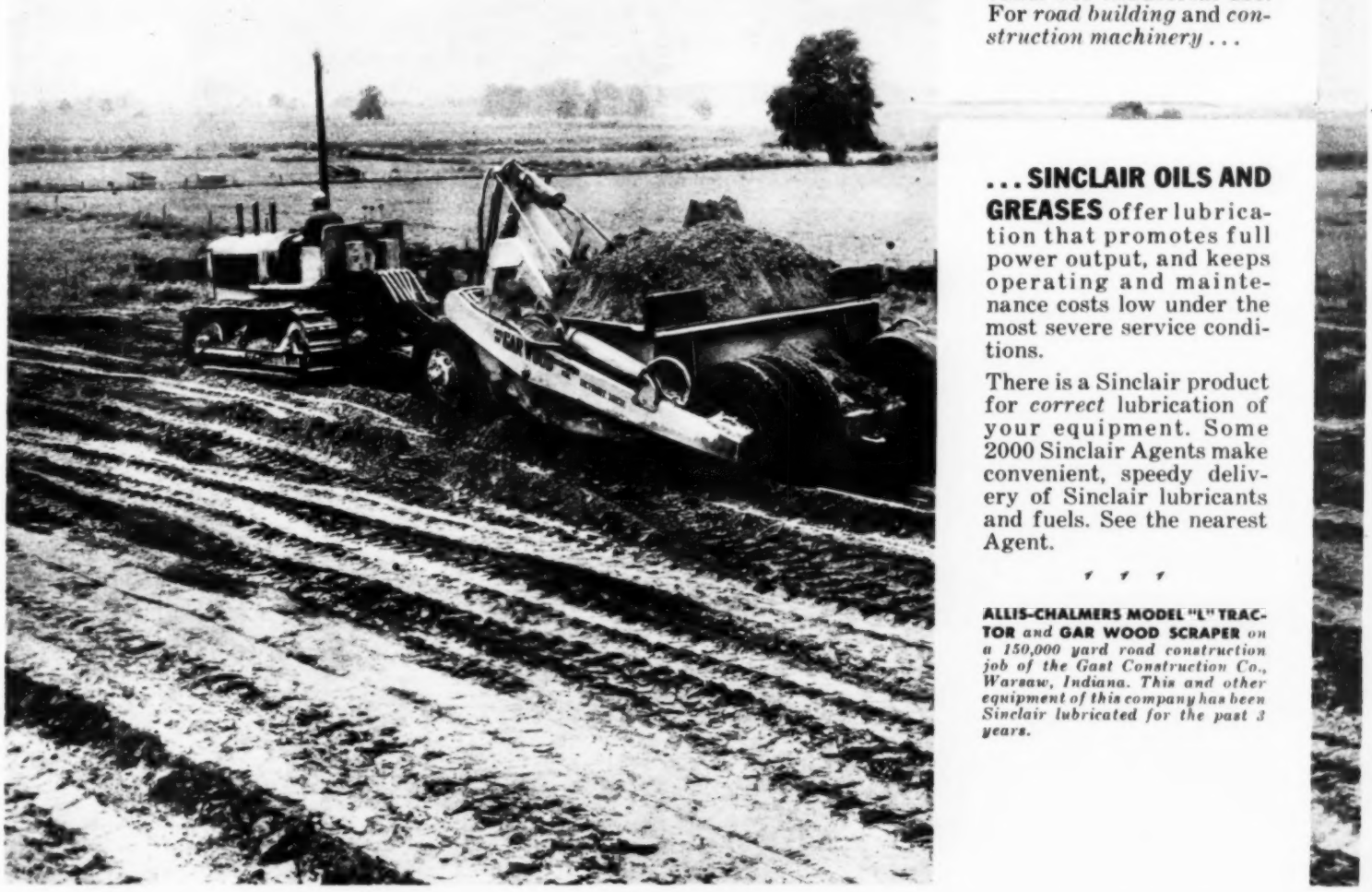
BARBER B G GREENE

STANDARDIZED MATERIAL HANDLING MACHINES

AURORA ILLINOIS



FROM THE SINCLAIR REFINERIES come 142 classes of specialized lubricants for industrial use. For *road building* and *construction machinery* . . .



. . . SINCLAIR OILS AND GREASES offer lubrication that promotes full power output, and keeps operating and maintenance costs low under the most severe service conditions.

There is a Sinclair product for *correct* lubrication of your equipment. Some 2000 Sinclair Agents make convenient, speedy delivery of Sinclair lubricants and fuels. See the nearest Agent.

* * *

ALLIS-CHALMERS MODEL "L" TRACTOR *and* **GAR WOOD SCRAPER** *on a 150,000 yard road construction job of the Gast Construction Co., Warsaw, Indiana. This and other equipment of this company has been Sinclair lubricated for the past 3 years.*

SINCLAIR INDUSTRIAL OILS

SINCLAIR REFINING COMPANY (Inc.)

2540 W. CERMAK RD. CHICAGO · 10 W. 51ST ST. NEW YORK · 1907 GRAND AVE. KANSAS CITY · 573 W. PEACHTREE ST. ATLANTA · FAIR BUILDING, FT. WORTH

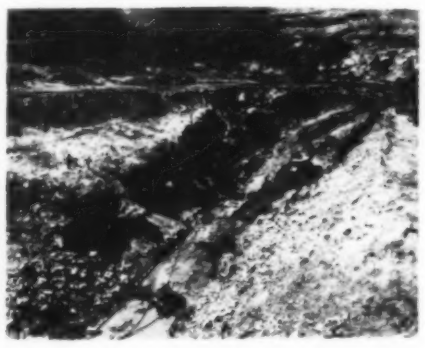
ATLAS EXPLOSIVES *at* HEADGATE ROCK DAM *bring further proof that* "Better Blasting Pays"

Aerial view of diversion dam, taken from downstream.

Diversion dam, shovel loading rock after blast.

Shovel at work in spillway.

Looking into bucket section.



Loading holes in rock in bucket section.

★

20,000 cubic yards moved by 4 shovels in 21 hours

It's on big jobs, like this Headgate Rock Dam, at Parker, Arizona, that products and service are really put through their paces. Costs *must* be low for a contractor to "keep his shirt." Using Atlas Explosives and Atlas Methods, Rohl-Connolly Co. of Los Angeles was able to set some enviable records—20,000 cubic yards averaged in 21 hours with 4 2½-yard shovels. That's really making it fly!

See your Atlas Representative the next time you have a tough job. Chances are he can give you some money-saving ideas on "better blasting."

★

ATLAS POWDER COMPANY, WILMINGTON, DEL.

Cable Address—Atpowco

Everything for Blasting

OFFICES

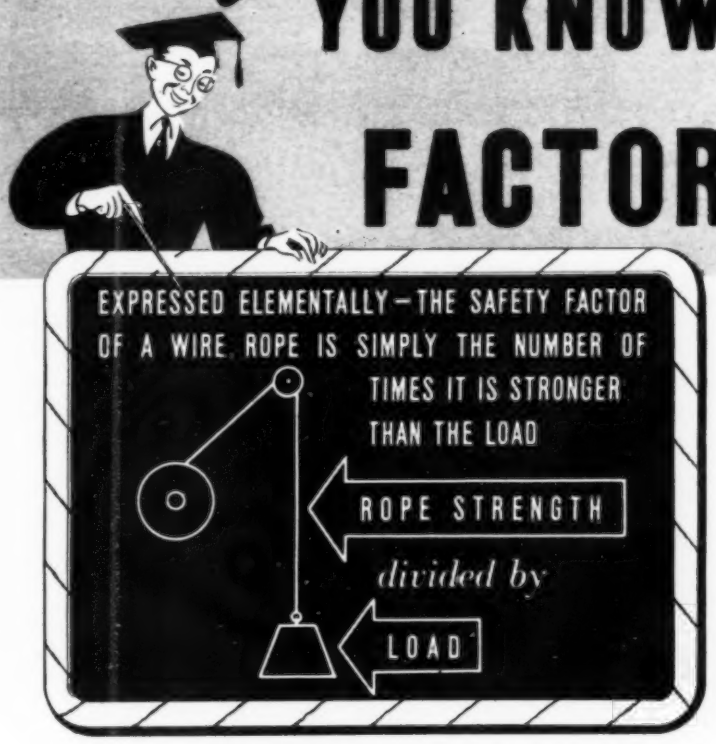
Allentown, Pa.	Denver, Colo.	New Orleans, La.	Pittsburgh, Pa.	Spokane, Wash.
Boston, Mass.	Houghton, Mich.	New York, N. Y.	Portland, Oregon	St. Louis, Mo.
Butte, Mont.	Joplin, Mo.	Philadelphia, Pa.	Salt Lake City, Utah	Tamaqua, Pa.
Chicago, Ill.	Knoxville, Tenn.	Picher, Okla.	San Francisco, Calif.	Wilkes-Barre, Pa.
	Los Angeles, Calif.	Pittsburg, Kansas	Seattle, Wash.	

ATLAS

EXPLOSIVES

CHEMICALS ATLAS EXPLOSIVES

Of course YOU KNOW HOW TO FIGURE FACTOR OF SAFETY


EXPRESSED ELEMENTALLY—THE SAFETY FACTOR OF A WIRE ROPE IS SIMPLY THE NUMBER OF TIMES IT IS STRONGER THAN THE LOAD
ROPE STRENGTH
divided by
LOAD

As a user of wire rope, you want to get as much service as possible from your wire rope—and, at the same time, guard against premature failure, accidents, production delays. In other words, you're concerned about wire rope safety factor.

We would like to be able to say, "Just take your dead load and multiply it by such and such a safety factor—and, presto! that's the rope strength you need". But, unfortunately, it's not quite as simple as that.

From our experience of many years in the wire rope business, we know that in order to determine Adequate Safety for a specific wire rope installation, it is necessary to take into consideration not only dead load *but* also all other possible load stresses, such as those created by the factors listed to the right. In addition, allowance must be made for other factors, such as the degree of protection desired against production delays and accidents.

Wire rope specifications, carefully worked out on this basis for individual installations, pay many times over in longer rope life and increased rope safety. We would welcome an opportunity to cooperate with you toward this end.

JOHN A. ROEBLING'S SONS CO.
Trenton, N. J. *Branches in Principal Cities*

This advertisement is published in the interest of all wire rope users, to help them obtain greater safety, service and efficiency from their wire rope.

ROEBLING
JAR *Wire Rope*

But—

Adequate Safety for a specific installation can be determined only by considering all these Vital Factors:—

- √ ACCELERATION
- √ DECELERATION
- √ LENGTH OF ROPE
- √ SPEED
- √ ATTACHMENTS
- √ REEVING CONDITIONS
- √ DRUM CONDITIONS
- √ CORROSION
- √ ABRASION
- √ PROTECTION AGAINST PRODUCTION DELAYS AND ACCIDENTS
- √√ CONSTRUCTION AND QUALITY OF WIRE ROPE

Therefore **For longer, safer wire rope service consult the nearest Roebling office, giving all pertinent data on your installations.**

Ask about **ROEBLING "BLUE CENTER" WIRE ROPE** *. . . either standard or preformed*

Postal Telegraph
ADNUNS
JA138 16=
RUSSELL T GRAY INC=
205 WEST WACKER DR CHICAGO=
TWO NEW ADNUN PAVERS FOR WASHINGTON NATIONAL AIRPORT,
MAKES GRAND TOTAL THIRTY PURCHASED BY WARREN BROS=
FOOTE CO.

BUILDING A 200 FOOT "ROAD" AT WASHINGTON NATIONAL AIRPORT.

Gravelly Point, Va. — Warren Bros. Roads Co., Boston, are placing 675,000 sq. yds. of 3½" hot mixed, hot laid asphaltic concrete in two courses on 150 and 200 foot runways with Adnun Black Top Pavers.

THERE'S only one thing that brought 29 repeat orders for Adnun Black Top Pavers from Warren Bros. Road Co., Boston — PROFITABLE PERFORMANCE! Long ago this contractor found that Adnuns pay out in better roads, lower costs, longer life. Warren Bros. likes Adnun Continuous Course Correction that levels out surface irregularities and leaves a smoother surface; the Overlapping Action Cutter Bar that makes perfect joints under pressure; the Hydraulic Controls for easier operation; the big capacity — over 1000 tons per day on some jobs; the non-skid surface produced; the Power Cut-Off that gives a clean break in the course where desired; the rugged, dependable construction that says here's a machine that's built from the ground up to stay on the job for years!

Proved on miles and miles of road paving, its natural that Warren Bros. again chose Adnuns for building the Washington National Airport runways where smooth surfaces, tight joints between as many as 20 parallel courses, high coefficient of friction, low cost operation and fast output are paramount.

Take a tip from a user of **30 Adnuns** — find out about these outstanding pavers before you bid on your next Black Top or Waterbound Macadam job. Write for a catalog today. THE FOOTE COMPANY, INC., Nunda, New York.

for Black Top- **ADNUN PAVERS** *for Rock-*

3 LIMAS SCORE HIGH TOTAL ON TWO OUTSTANDING JOBS

Mr. Stanley Bent of Bent Brothers, Incorporated, & Griffith Company, Los Angeles, California, writes "after moving over two million cubic yards of excavation on the Conchas Dam and Friant Dam, our three LIMAS are still in very good condition and going strong." Continuous operation in hard digging can be expected of LIMA excavators because their design is right and they have the power and ruggedness to make big yardage possible under all conditions.

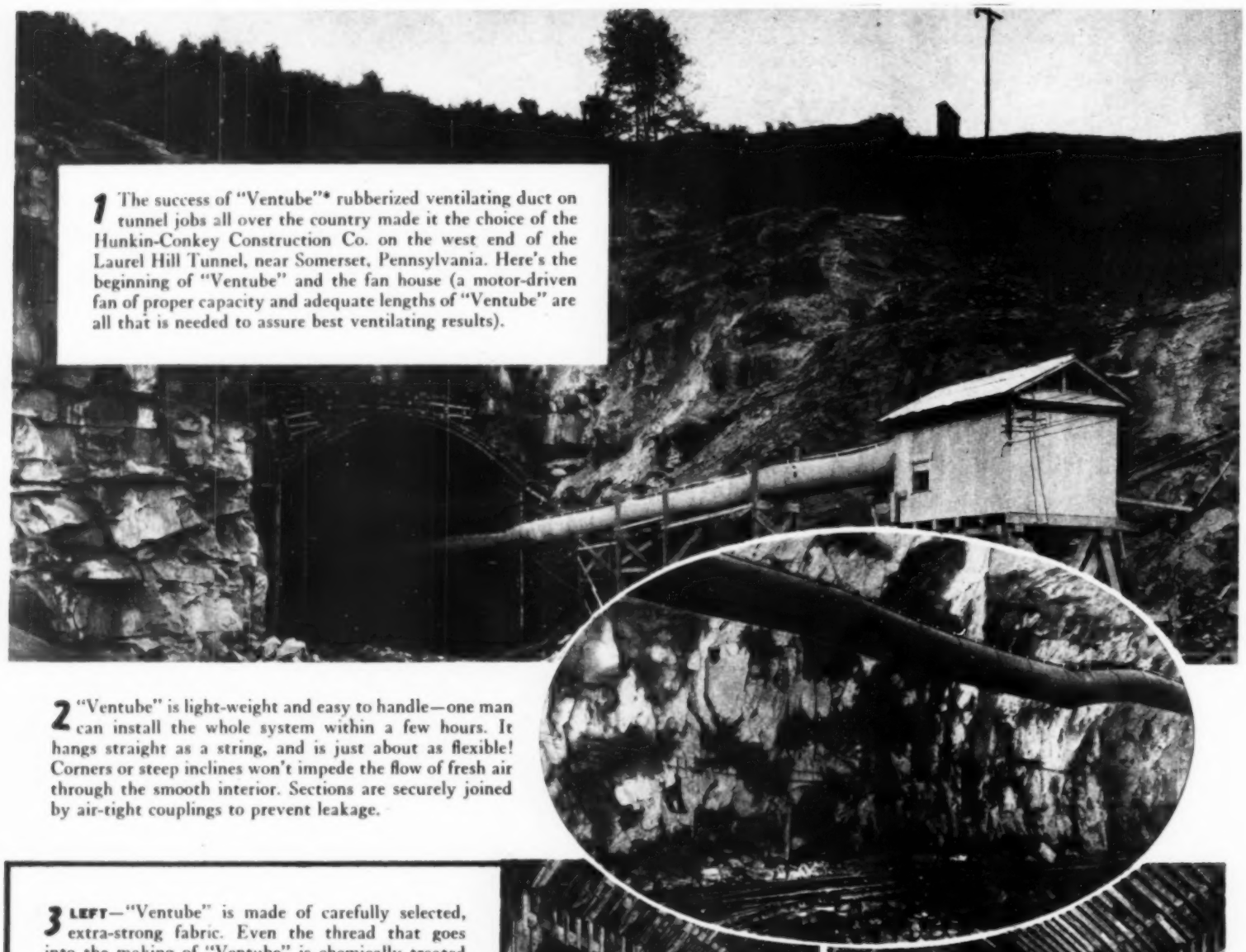
Write for free bulletin TODAY

LIMA LOCOMOTIVE WORKS, INCORPORATED
SHOVEL and CRANE DIVISION - - - - - - - LIMA, OHIO
NEWARK, N. J. NEW YORK, N. Y. DALLAS, TEX. CHICAGO, ILL. MEMPHIS, TENN. PORTLAND, ORE. LOS ANGELES, CAL. SAN FRANCISCO, CAL. SEATTLE, WASH. SPOKANE, WASH. PHILADELPHIA, PA. VANCOUVER, B.C. MONTREAL, QUEBEC, CAN.

LIMA SHOVELS DRAGLINES CRANES

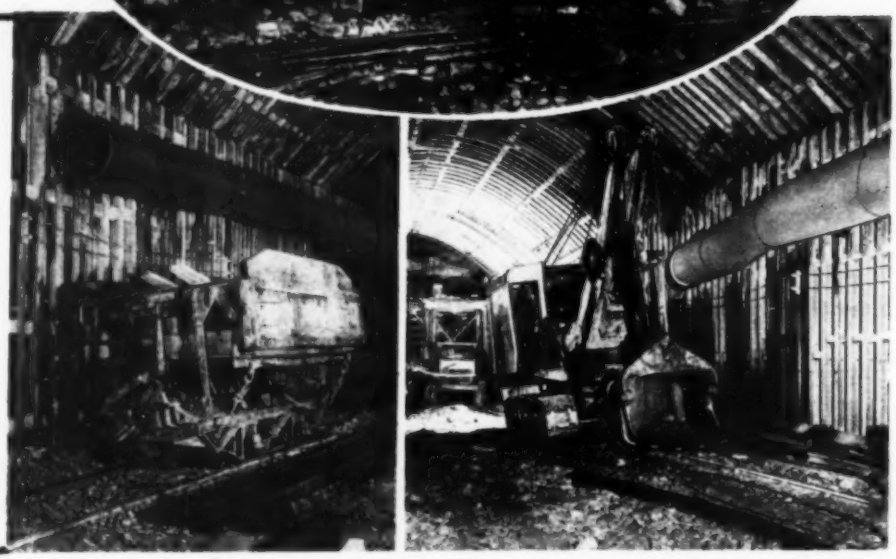
LIMAS ARE BUILT IN ¾ YARD CAPACITY and LARGER

Here's where VENTUBE* played an important part in the construction of the Pennsylvania Turnpike!



1 The success of "Ventube"* rubberized ventilating duct on tunnel jobs all over the country made it the choice of the Hunkin-Conkey Construction Co. on the west end of the Laurel Hill Tunnel, near Somerset, Pennsylvania. Here's the beginning of "Ventube" and the fan house (a motor-driven fan of proper capacity and adequate lengths of "Ventube" are all that is needed to assure best ventilating results).

2 "Ventube" is light-weight and easy to handle—one man can install the whole system within a few hours. It hangs straight as a string, and is just about as flexible! Corners or steep inclines won't impede the flow of fresh air through the smooth interior. Sections are securely joined by air-tight couplings to prevent leakage.



3 LEFT—"Ventube" is made of carefully selected, extra-strong fabric. Even the thread that goes into the making of "Ventube" is chemically treated to resist fungus growth. Then the fabric is both coated and impregnated with a resilient composition to resist acid, gases, fungus and moisture! And "Ventube" is as strong in the warp direction as in the filler so that concussions can't hurt it!

4 RIGHT—"Ventube" gets right up to the heading, where you need plenty of fresh air most of all! During blasting the sections nearest the face easily slide back to prevent damage from flying rocks. Immediately afterwards "Ventube" slides forward again, bringing you clean, pure air from the outside.

• • •

Install a few sections of "Ventube" in your toughest working. See how easy it is to handle—how it helps speed up work and cut costs! Write du Pont today!

DU PONT VENTUBE

THE FLEXIBLE VENTILATING DUCT

E. I. DU PONT DE NEMOURS & COMPANY (INC.)

"FABRIKOID" DIVISION • **FAIRFIELD, CONNECTICUT**

**"Ventube" is du Pont's reg. trade mark for rubber impregnated flexible ventilating duct.*

NOW . . . I'M BIDDING LOWER AND EARNING MORE

No question of it — digging costs have come down! These days, to make money in the excavating business, you want a machine that gets around quickly and easily on a variety of jobs . . . a machine that's built of rolled alloy steels . . . huskier, to stand the gaff of hard digging and ask less in the way of repairs. These P&H's have shown the way, with modern all-welded construction — proved themselves through six years of dependable cost-cutting production for hundreds of owners. If you're still using old-style equipment you'll find it hard to compete against these new P&H's. Why not own one yourself?

P&H EXCAVATORS

The P&H Model 100 (⅜-yd.) shovel, fast digging, easy operating, ideally suited for hundreds of excavating jobs. It is equipped with tractor-type crawlers, with rolled steel shoes that can be removed without disturbing the crawler track. It's powered by the husky Ford V-8 engine, for rock-bottom operating costs.

★ *Ask about the new P&H Excavator Control — the key to smoother, faster operation. Bulletin X-60.*

P&H excavators are made in 18 different sizes, from ⅜ to 5 cu. yds. capacity; gasoline, Diesel or electric power. Literature is available on all models.

General Offices . . . 4494 WEST NATIONAL AVENUE, MILWAUKEE, WISCONSIN

HARNISCHFEGER CORPORATION

EXCAVATORS • ELECTRIC CRANES • ARC WELDERS — P&H — HOISTS • WELDING ELECTRODES • MOTORS

NOW, *in construction for defense,* THE DISTRIBUTOR PLAYS A BIGGER ROLE THAN EVER

With the national defense program gaining momentum, vital construction projects are being rushed from the blueprint stage to the construction stage. Overnight, contractors are being awarded huge contracts in all parts of the United States and Canada. Federal government contracts are being awarded on the same basis as private-industry contracts. The government is asking proof only of the contractor's experience on fee and competitive bid construction — *what kind of plant is available? — what is the status of the contractor's equipment? — what are his financial resources?*

All of which makes the distributor a more valuable ally than ever to the contractor. His proximity to vital projects saves a lot of valuable time for the contractor. His well stocked warehouses make available night and day new machines, machine parts, supplies and materials. His trained mechanics can be of increasing help to the contractor in planning a rush job and laying out the contractor's plant and in instructing equipment operators in the operation and care of modern machines.

Right now contractors are telling us how they appreciate the services of the distributor. Read what some of them are saying:

Chief Engineer of a construction company — The distributors of the New York area are a real help to us in our work. They usually have the parts but if they don't they get them within 24 to 48 hours.

Big earth-moving contractor — The biggest thing the equipment manufacturer can do is to have his machines in stock in the principal cities for immediate delivery. He should also be sure to maintain a complete stock of parts.

Superintendent, construction company — Most of our equipment is serviced by the distributor. Allis-Chalmers, Koehring, Ingersoll-Rand see to it that parts are adequately stocked in our territory.

Secretary-Treasurer, construction company — We find the distributors a big help to us. They furnish trained men to instruct our operators so we can get the utmost in efficiency out of our machines.

Contractor's engineer — If the manufacturer lists his agents or distributors in his advertising in Engineering News-Record and Construction Methods I call up the nearest one to get the price and further details. The distributor is the shortest route between the contractor and manufacturer — if we know who the nearest distributor is and where he's located.

Owner of contracting company — Before we buy heavy equipment we want to see it in operation on a job. By contacting the distributor we usually can be steered to a job.

Superintendent, concrete contractor — Western manufacturers particularly should see that their agents or distributors in the New York area are plentifully supplied with parts. Fitzgerald & Hudson of Dunellen, N. J., get parts to us in the middle of the night when we need them that badly. Ehrbar in Brooklyn worked all night once to help us out on machine repairs.

President-General Manager, engineering-contracting firm — When the name of a contractor using a machine or the distributor is published in the advertisement, and my interest in the machine is aroused, I can call on either one or both, to get the price and see the machine in action. This is the quickest way to make a customer out of us.

One of a series of advertisements sponsored by Engineering News-Record and Construction Methods to remind readers of the important role the distributor plays in the economics of construction.

Have you ever given the distributor the opportunity to open up and show you what he can do to solve your problems and speed up the job? Next time you get a contract try him out. If he isn't listed in the manufacturer's advertising in Engineering News-Record and Construction Methods, consult the classified section of his local telephone book under "Contractor's Equipment."

Keeps Engines Cleaner · · · · · Lubricates Better

Many gruelling tests in high-speed Diesels have established Lion Naturalube's ability to improve engine performance. Test after test showed: Naturalube's solvent and penetrative properties kept engines cleaner by removing hard carbon deposits from pistons, rings and valves; Naturalube's 3 to 10 times stronger protective film safeguarded vital engine parts even under emergency overloads. Results: Increased horsepower—less fuel consumption—reduced wear—and fewer lay-ups for carbon cleaning and repairs. Thousands of test hours—and thousands of test miles by profit-wise operators of gasoline and Diesel engines prove that Naturalube is unequalled for economical, dependable operation day after day—week after week. Use Naturalube with confidence; it is non-corrosive and highly resistant to heat and oxidation.

* ***Naturalube Diesel and Heavy Duty Oil is specially fortified or reinforced to resist the effects of intensified heat and oxidation under extreme conditions. Engines constantly operated at high speeds and or heavy loads need this super lubricant.***

BASICALLY DIFFERENT LUBRICATING OIL

Removes Hard Carbon

- **Higher Resistance to Heat and Oxidation**
- **Non-Corrosive**
- **3 to 10 Times Stronger Protective Film**

ADDS POWER
SAVES WEAR
SAVES FUEL
SAVES SHUT-DOWN TIME

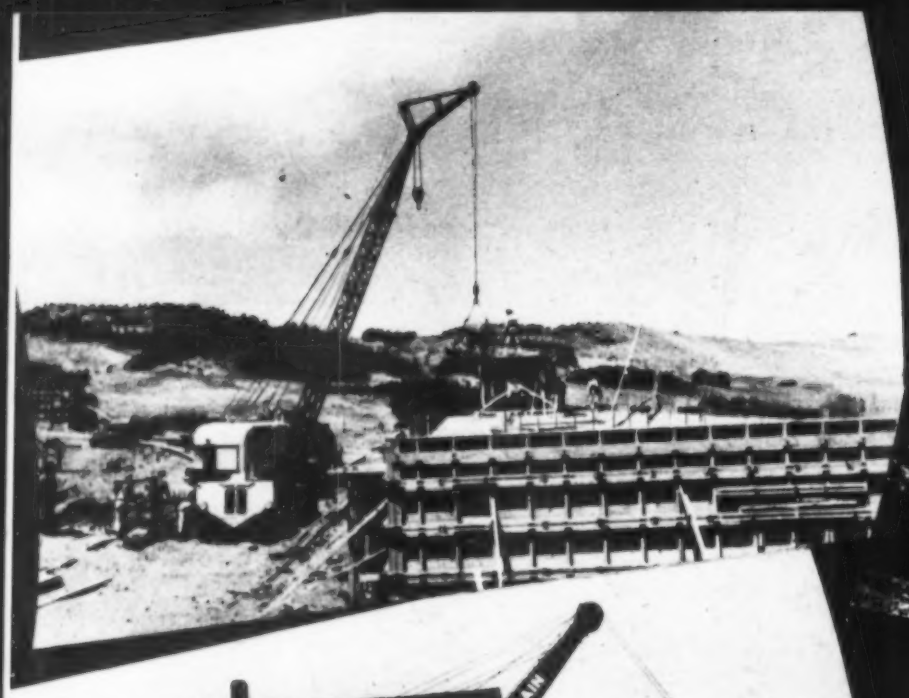
For visible proof of Naturalube's money-saving properties and details of money-back guarantee phone the nearest Lion Naturalube dealer or write Lion Oil Refining Company, El Dorado, Arkansas.

LION PETROLEUM PRODUCTS

LION *Naturalube*

MOTOR OIL and DIESEL AND HEAVY DUTY OIL*

Made By **LION OIL REFINING COMPANY · · El Dorado, Arkansas**



"M" day IS HERE!

● "Mechanize" is the order of the day. That's why the Moto-Crane* is going great guns. Contractors took to this rubber-tired unit right from the start. Scores of them are now in service, handling jobs of every size, shape and description—and it's only the beginnin'!

The Moto-Crane is outstanding on three counts. It's 100% mechanized, being mounted on a Crane Carrier specially designed for highway and off-the-road travel. Secondly, the patented sloping machinery frame gives Balanced Design in turntable. That's why this unit can handle big capacities with long booms and low booms (as evidenced above). And lastly, it's as versatile as a one-man band because readily interchangeable boom equipment permits operation as a crane, dragline, clamshell, shovel or backdigger.

The Moto-Crane is available in three sizes. Better get complete information now. Mechanized Moto-Crane service is here to stay.

UNIVERSAL CRANE DIVISION • THE THEW SHOVEL CO.
LORAIN, OHIO
** Trade Mark*

THEW CENTER DRIVE

FACTS ABOUT
THE CRANE • THE CARRIER

1. Simplified Center Drive direct-to-the-point power application.

2. Balanced turntable design, to provide the greatest capacities per pound of weight.

3. Steel erector's precision boom hoist with positive power control of boom lowering.

4. 2-piece, pin-connected, all welded boom with center sections and straight or goose-neck tips.

5. Cab type tagline which functions efficiently at all boom angles and digging depths.

6. Winch Head and Third Drum attachments.

7. Convertible to Dragline, Clamshell, Shovel, Backdigger.

1. 3 axle mounting on 10 rubber tires. Both tandem rear axles drive.

2. High speed transmission range for road travel—low range for tough going off road or on job.

3. Built of standard major unit parts available all over the country.

4. Close-coupled, 175" wheelbase for better maneuvering. Steering gear designed for soft ground travel.

5. Special chassis frame design which eliminates reinforcing.

6. 10 speeds forward—and 2 reverse. Unit will climb a 30% grade.

7. Rocker arm rear end replaces springs—gives flexibility for road travel—rigidity for operation.

UNIVERSAL LORAIN MOTO-CRANE*

NO JOB TOO SMALL OR SHORT—NO JOB TOO BIG OR TOUGH

Construction Methods

ROBERT K. TOMLIN, Editor

Volume 22 | OCTOBER, 1940 | Number 10

River Diverted

AT SHASTA DAM

A CHARGE OF DYNAMITE which blasted an initial opening in a dike at the upstream end of a newly prepared channel started, in August, the diversion of the Sacramento River at Shasta dam, U. S. Bureau of Reclamation project near Redding, Calif. The new temporary channel, 50 ft. wide and 2,000 ft. long, will carry the stream until the advent of high water next spring, when the river will again be allowed to flow in its natural course which, by that time, will have been excavated and paved with low blocks of concrete forming the base of Shasta dam. The 560-ft.-high concrete structure is being built by Pacific Constructors, Inc.

Photos, U.S. Bureau of Reclamation

BLAST OPENS DIKE at upstream end of channel, flanked by concrete wall, newly prepared to carry flow of Sacramento River while age-old course is excavated to bedrock for foundation of middle section of dam.

TONS OF EARTH AND ROCK are dumped across Sacramento River by 25-cu.yd. trucks to form cofferdam for diverting stream into temporary channel.

DIVERSION CHANNEL, at left, is 50 ft. wide and 2,000 ft. long. Diversion was half completed on Aug. 14 when this photograph was taken.

ONE-LEG STEEL BENTS at two of the piers, and open steel grid deck, are unusual features of 1,824-ft.-long bridge of deck-plate-girder type spanning Housatonic River between Stratford and Milford, Conn. Single column towers of canopy type were chosen to limit plate-girder spans to 224 ft. and provide clear navigation width of 150 ft. at point where river channel makes angle of 58 deg. with line of bridge. Tower heights above piers are [illegible] ft., respectively. Bridge designed by Connecticut State Highway Department was constructed by A. I. Savin Construction Co. (substructure) and American Bridge Co. (superstructure.)

Wide World

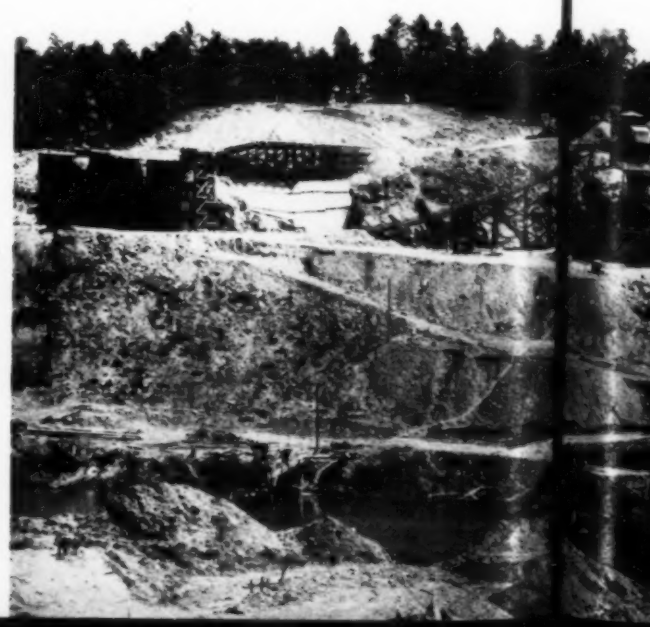
HOUSING FOR NATIONAL DEFENSE WORKERS is discussed at dinner in Washington, D. C. by (left to right): GERARD SWOPE, former General Electric Co. president and now chairman of New York City Housing Authority; JOHN M. CARMODY, Federal Works Administrator; and NATHAN STRAUS, U. S. Housing Authority Administrator.

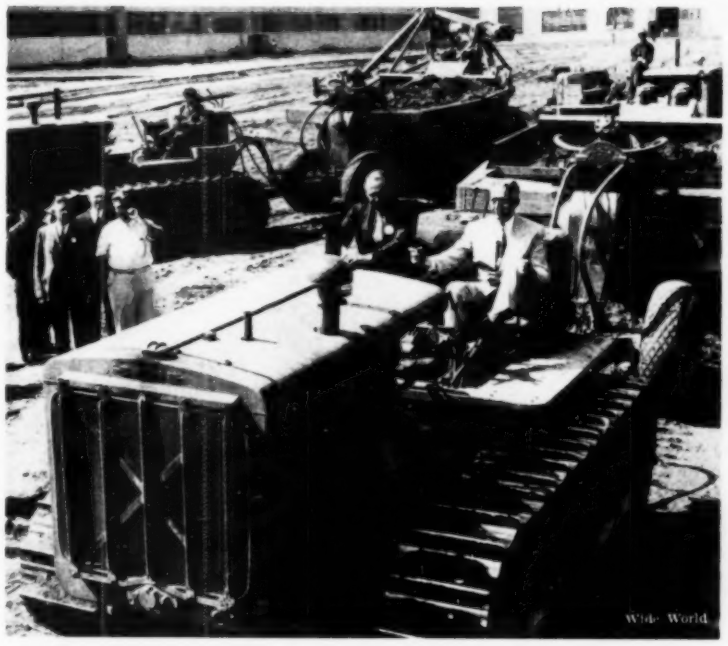
THIS MONTH'S NEWS REEL

AT GREEN MOUNTAIN DAM, U.S. Bureau of Reclamation project on Blue River, Colorado, earth and rock to form compact layers in 270-ft.-high fill are delivered by 24-cu.yd. end-dump trucks, spread by tractor-bulldozer outfits and compacted by sheepsfoot rollers. Contractor is Warner Construction Co., of Chicago. Dam will contain 3,122,000 cu.yd. of impervious rolled fill and 1,739,000 cu.yd. of rock fill and riprap.

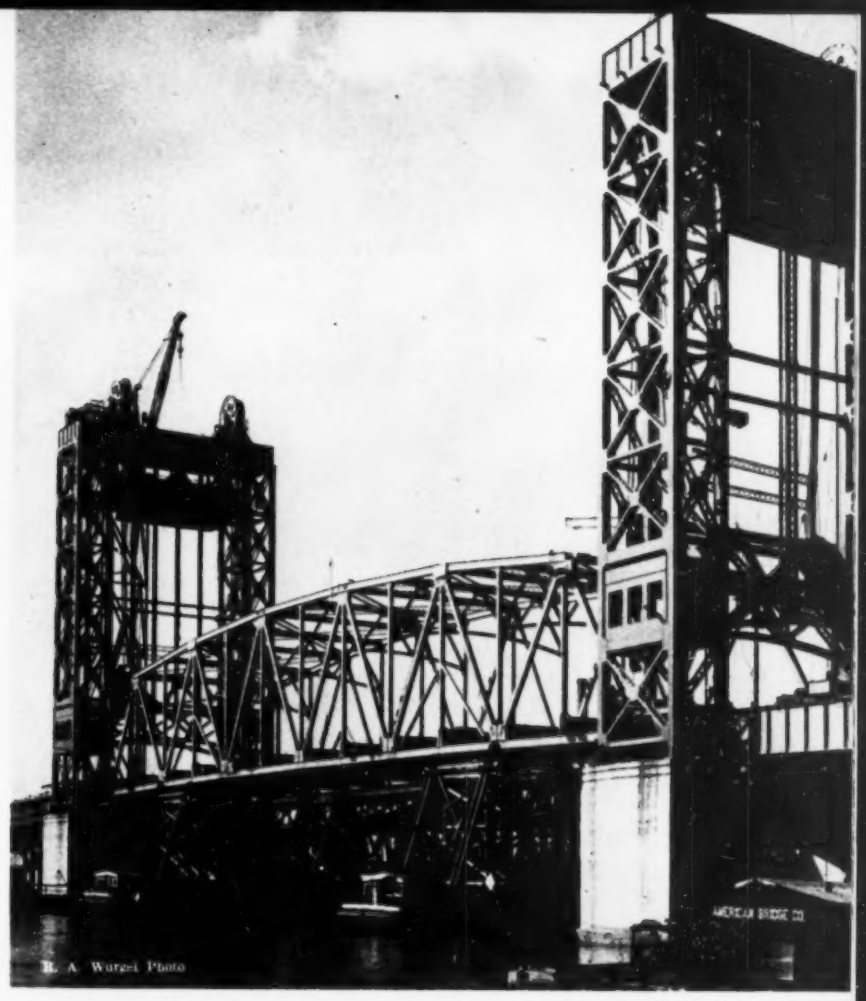
CHICKAMAUGA DAM 104-ft. high concrete and earthfill structure on Tennessee River and latest power, navigation and flood control project to be completed by Tennessee Valley Authority, is dedicated Sept. 2 by President Roosevelt.

Wide World

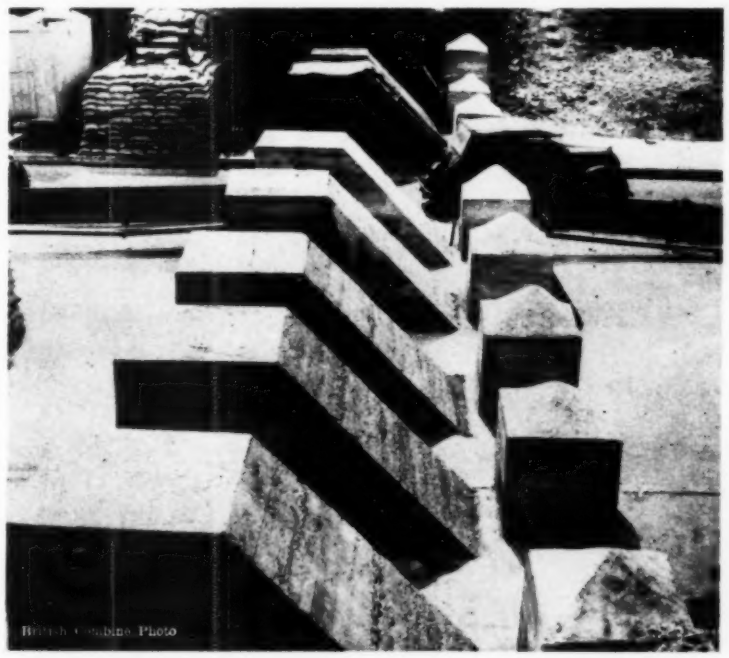




AIRCRAFT PLANT EXPANSION to step up mass production of planes for national defense is begun at Baltimore, Md. by Glenn L. Martin Co. Glenn L. Martin, president, operates tractor-scraper outfit to break ground for new factory buildings which will increase company's present floor space of 1,263,000 sq. ft. to 3,000,000 sq. ft.



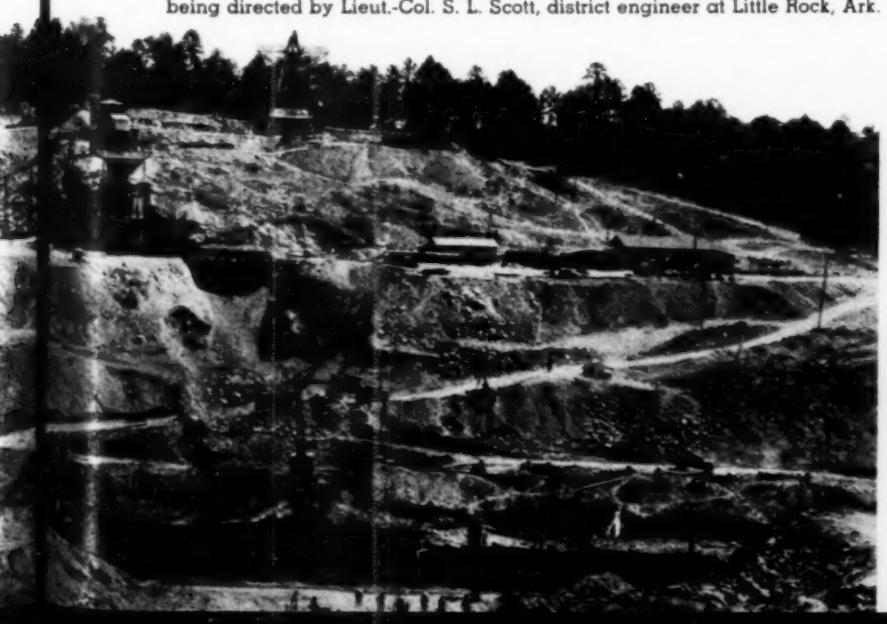
VERTICAL LIFT SPAN with length of 332½ ft. is floated into place and raised on new 2,004-ft. long Passaic River bridge on Lincoln Highway between Jersey City and Newark, N. J. Structure being erected by American Bridge Co. for New Jersey Highway Department will replace existing swing span of low vertical clearance. New lift span will provide 40-ft. vertical clearance for river traffic. New span was erected on falsework pile bents, picked up by timber falsework on two barges and floated into position during low tide.



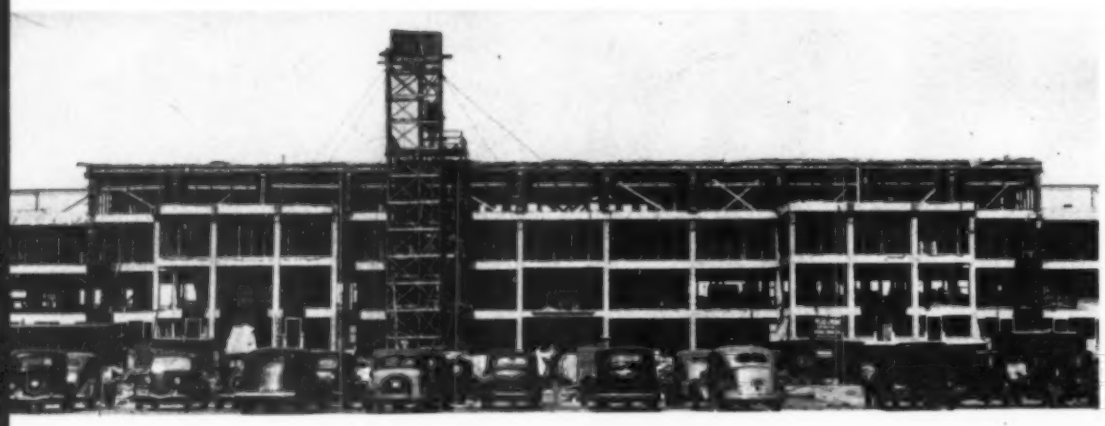
TO IMPEDE ENEMY FORCES (left) in event of invasion huge blocks of concrete have been placed across main roads in England to obstruct movement of tanks, artillery, trucks and other mobile equipment.

TALL STEEL TRESTLE (below) is erected at U.S. Bureau of Reclamation's Friant dam, in California, to carry hammerhead and revolving cranes for placing 2,000,000 cu.yd. concrete in main body of 325-ft. high structure with crest length of 3,340 ft. Buckets of concrete will be delivered on 2,200 ft.-long trestle by diesel-electric trains of Griffith Co. and Bent Co., contractors, who bid $8,715,358 for job. Steel trestle legs will be permanently embedded in concrete as pouring proceeds to finished height.

NIMROD DAM (below), concrete gravity type structure in Arkansas, is scene of construction activity as Russ Mitchell, Inc., and Brown & Root, Inc., contractors, of Houston, Texas, erect cellular cofferdam of sheetpile cylinders and excavate foundation for first concrete dam to be built in Arkansas and White River basin under comprehensive flood control plan of Corps of Engineers, U. S. Army. Project on which bid was $1,100,689 is being directed by Lieut.-Col. S. L. Scott, district engineer at Little Rock, Ark.



CONSTRUCTION FOR



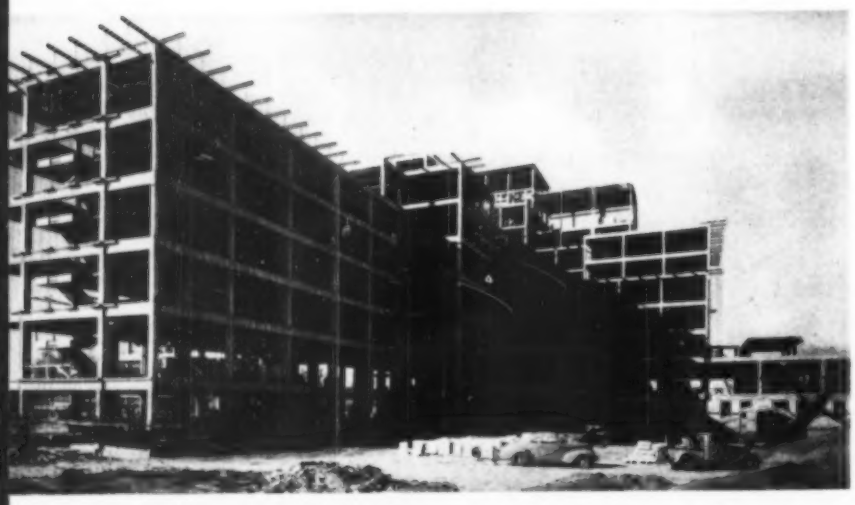
PERMANENT BARRACKS of concrete and steel are erected under contract with Quartermaster Corps by Mead & Mount Construction Co. for Army Air Corps at Lowry Field, Colorado.

CONCRETE CONSTRUCTION is employed at 125-man barracks erected at Fort Crook, Neb.

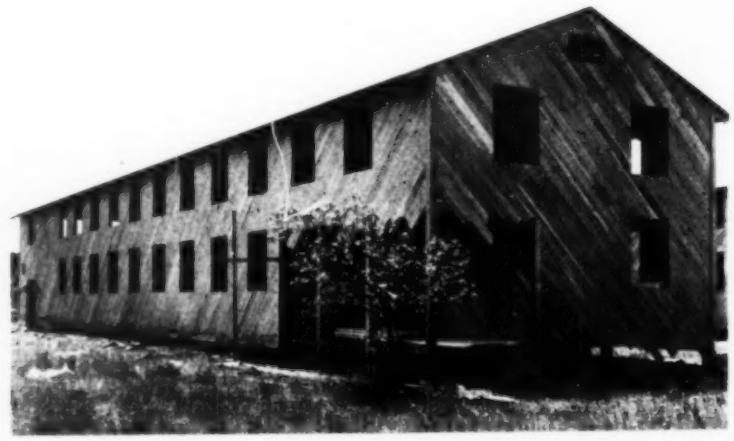
CONSTRUCTION IS BEGINNING to feel the impact of the nation's $15,000,000,000 program for rearmament and national defense. Expansion of our military and naval establishments is calling for construction covering a wide range of types and sizes, and the tempo of activity in the award of contracts and the prosecution of work by day labor is being stepped up week by week.

On this and following pages are reproduced photographs, from official sources, indicating representative kinds of construction in progress or recently completed to serve Army and Navy needs. They include air bases and airports, with their necessary hangars, shops and other service buildings, mess halls and barracks of both temporary and permanent construction, shipways, warehouses, hospitals, water supply and sewerage facilities and structures of other types needed for housing personnel and producing and storing equipment and materials for defense purposes. Geographically, these projects are spotted at sites extending from coast to coast.

Photos released by
Quartermaster General's Office
U. S. Army



FITZSIMONS GENERAL HOSPITAL is built under direction of Army's Constructing Quartermaster at Denver, Colo., by Great Lakes Construction Co.



TEMPORARY BARRACKS of timber design are erected at Fort Lewis, Wash., to provide quarters for Air Corps troops.

Photo, U. S. Army Air Corps

AT CHANUTE FIELD (left) in Illinois, personnel of U. S. Army Air Corps, will be housed in these three-story permanent barracks with exterior walls of brick construction.

Photo, U. S. Army Air Corps

NATIONAL DEFENSE

NAVY

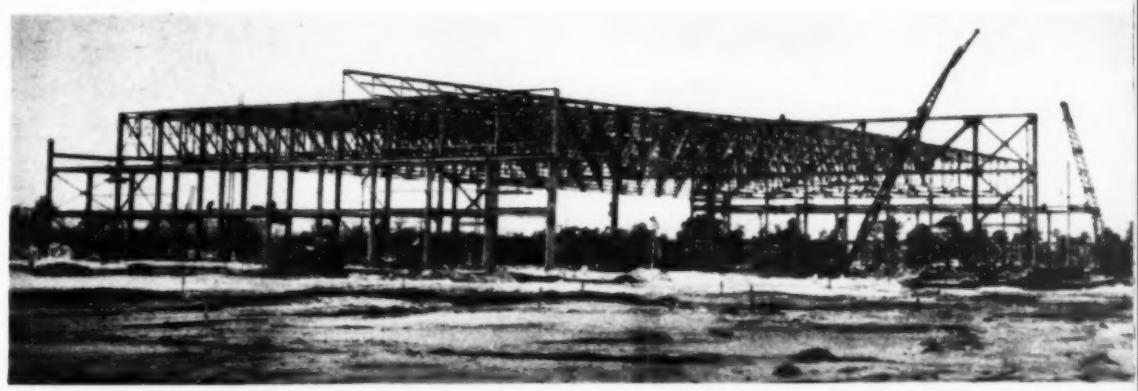
Still in preliminary stages at this writing are additional large-scale works for the manufacture of ammunition and ordnance, for the housing of defense workers and for the shelter of troops in huge cantonments to be rushed to completion following congressional action on measures covering selective training and military service for all United States citizens between age limits of 21 and 35 years.

Construction involved in the U. S. Navy's shore establishment is under the direction of the Bureau of Yards and Docks, of which Rear-Admiral Ben Moreell is chief. Responsibility for Army construction heads up in the office of the Quartermaster General, Major-General E. B. Gregory, under the direct supervision of the Construction Division, of which Brigadier-General C. D. Hartman is chief.

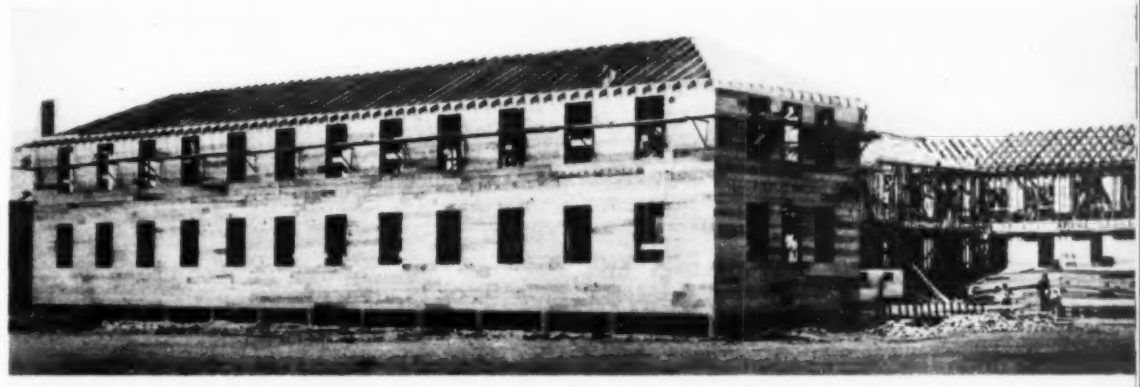
The accompanying photographs are reproduced with the permission of the proper Army and Navy authorities. In the case of Navy construction, locations of projects may not be mentioned.

Official Photos, U. S. Navy, Released by Bureau of Yards and Docks

PERMANENT BARRACKS BUILDINGS, constructed as PWA project, will accommodate personnel at Marine Corps base.



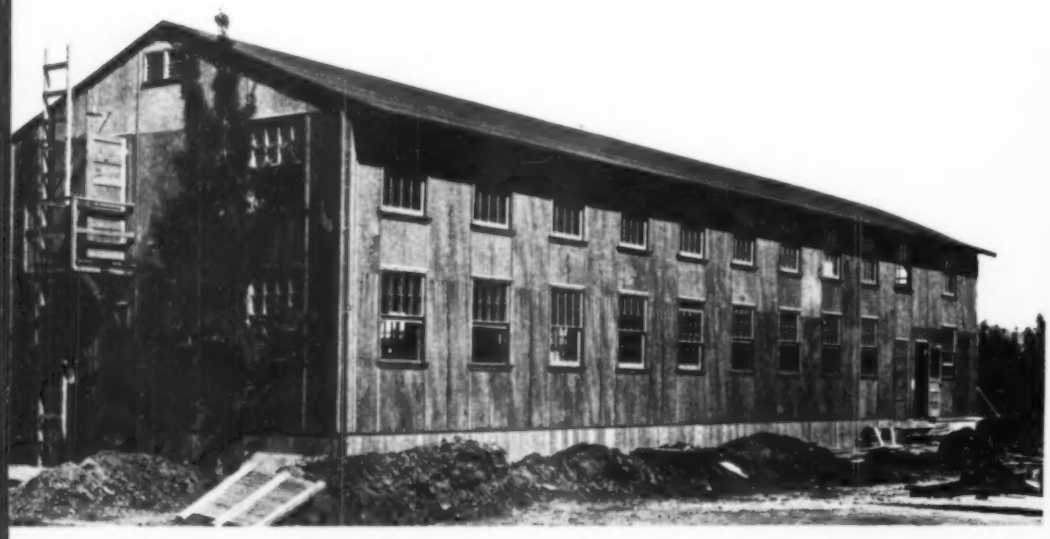
ANOTHER HANGAR takes form as cranes erect steel for new structure at Naval air station.



TWO-STORY BARRACKS (right) of wood-frame design are erected to house Navy personnel at aviation base.

HANGARS FOR LANDPLANES (below) are constructed at new base field for Navy.

CONSTRUCTION FOR ARMY

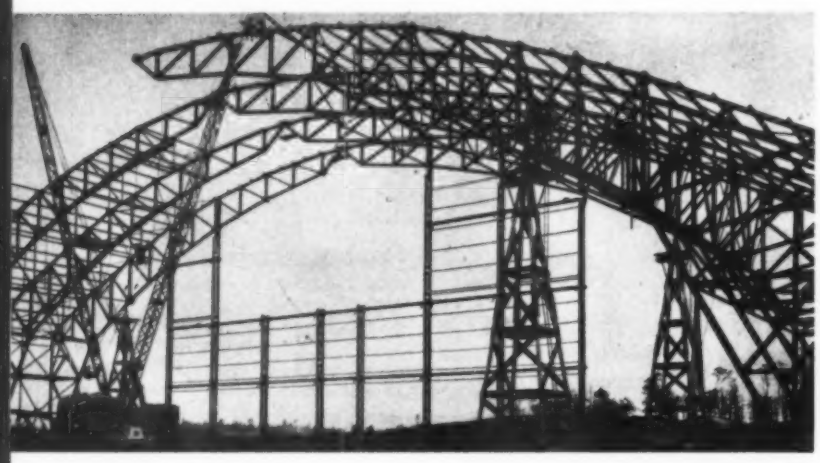


EXTERIOR PLYWOOD SHEATHING is feature of new barracks buildings erected recently at March Field, California.

Photo, U. S. Army Air Corps

BRIGADIER-GENERAL C. D. HARTMAN, chief, Construction Division, Quartermaster Corps, U. S. Army.

Photo, Harris & Ewing

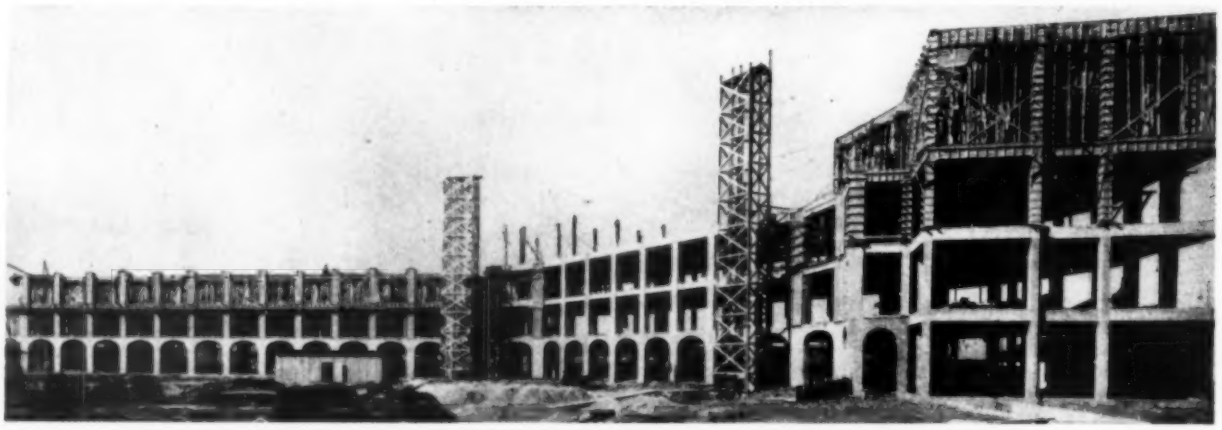


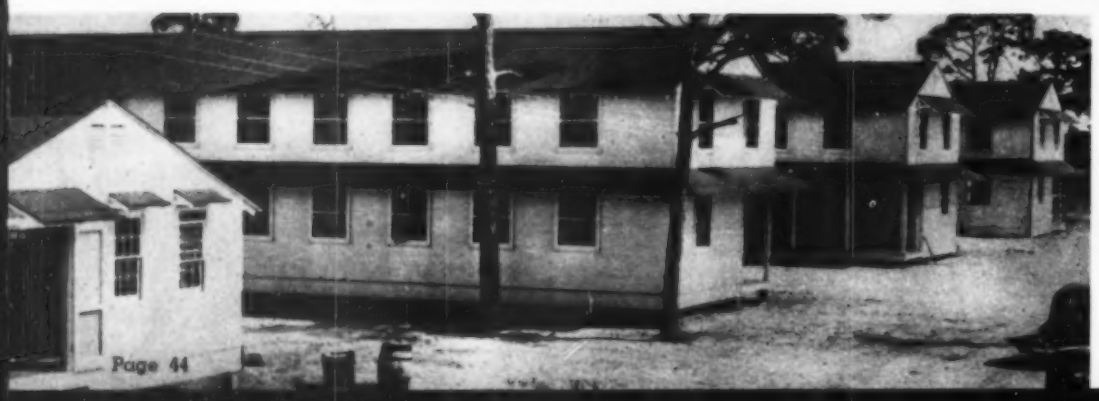
CRANES ERECT STEEL for airplane hangar at McChord Field, Washington.

Photo, U. S. Army Air Corps

IN HAWAII, concrete barracks are built at Hickam Field to house Army Air Corps.

PERMANENT BARRACKS (right) at Fort Benning, Ga., are large three-story structures of reinforced concrete design.





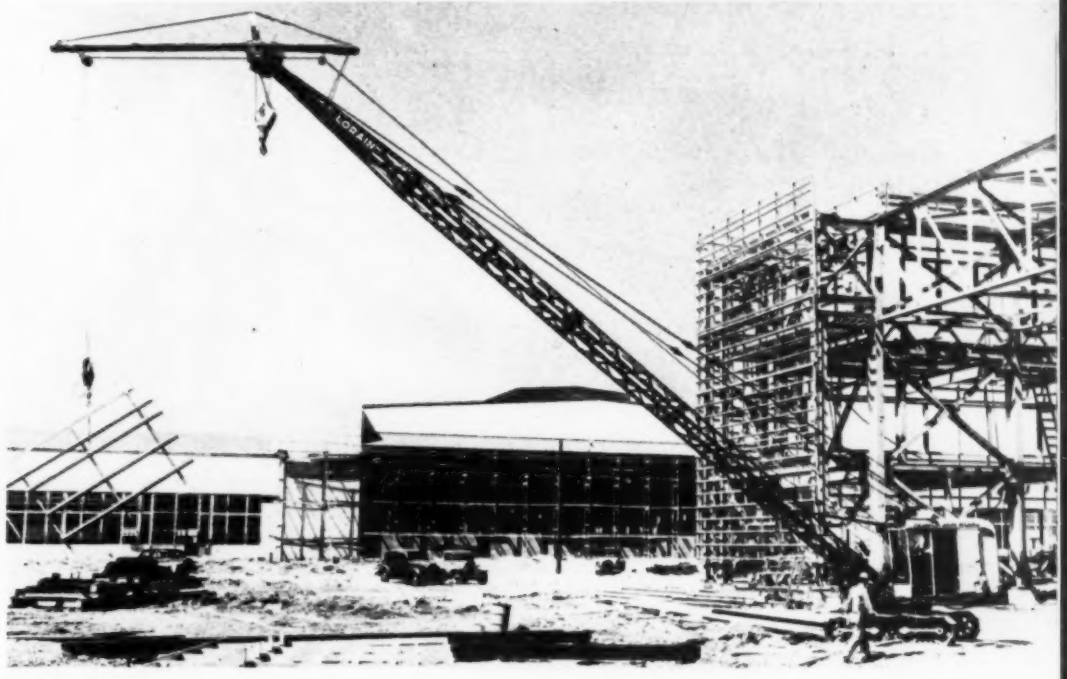
TEMPORARY BUILDINGS (left) of two-story type take form at MacDill Field, in Tampa, Fla.

Photos, Quartermaster Corps, U. S. Army

NATIONAL DEFENSE

NAVY

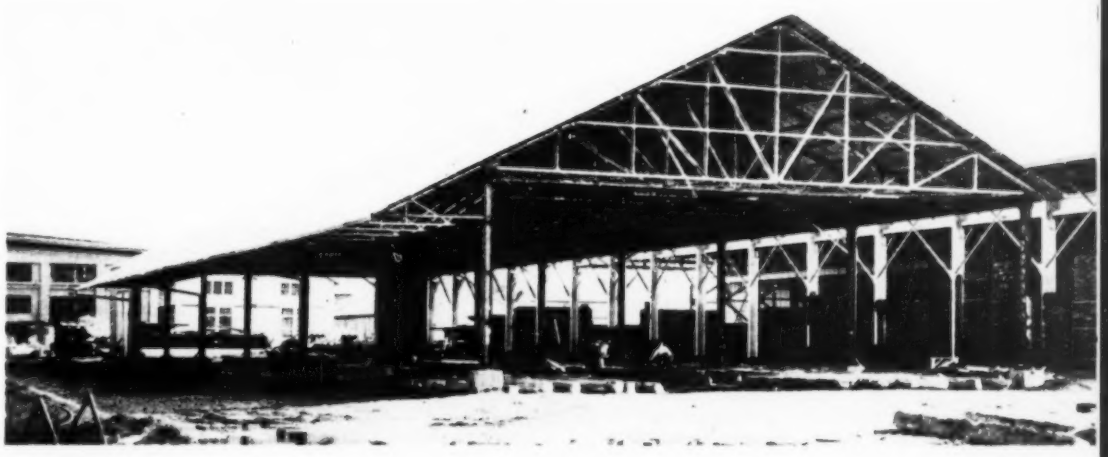
REAR-ADMIRAL BEN MOREELL, chief, Bureau of Yards and Docks, U. S. Navy.



60-FT. BOOM on Lorain crawler crane sets steel for two new seaplane hangars, each 372x240 ft. in plan, at Naval air base.—Photo from Thew Shovel Co.

STRUCTURAL ASSEMBLY SHOP, (left) with walls containing large areas of glass for well-lighted interior, nears completion at Navy Yard.

COVERED LUMBER STORAGE (right) is provided by this structure at Navy Yard.



STEEL ERECTION (below) is under way for seaplane hangar at Naval air station.

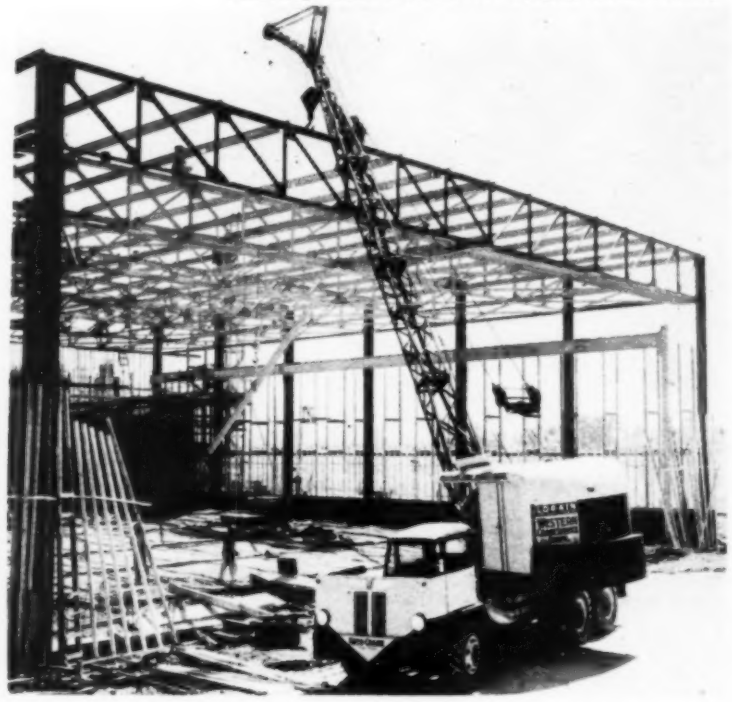
Official Photographs
U. S. Navy

CONSTRUCTION FOR

Photos, Quartermaster Corps, U. S. Army

MESS HALL AND BARRACKS for Air Corps at Chanuté Field, Illinois, involves large-scale concrete construction.

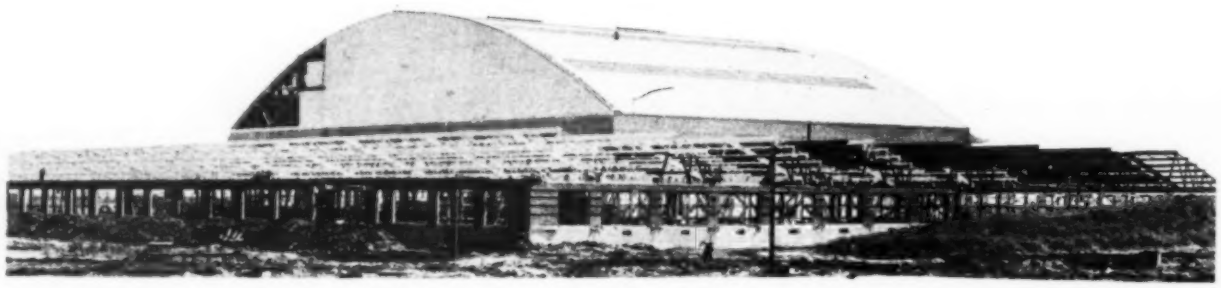
Photo, U. S. Army Air Corps



STEEL ERECTION for new Army buildings at Moffett Field, in California, is handled by two Lorain moto-cranes.—Photo from Thew Shovel Co.

CONSTRUCTION (right) at Chanute Field, Illinois, includes hangar and school building for Army Air Corps personnel.

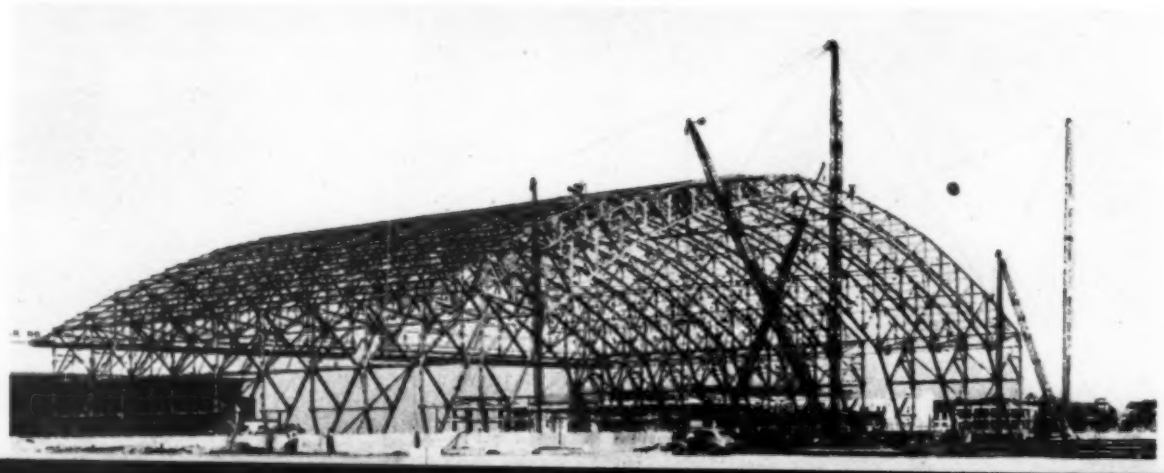
Photo, U. S. Army Air Corps



ENLISTED MEN (left) at Maxwell Field, in Montgomery, Ala., will be housed in one-story barracks under construction in foreground of photo.

Photo, U. S. Army Air Corps

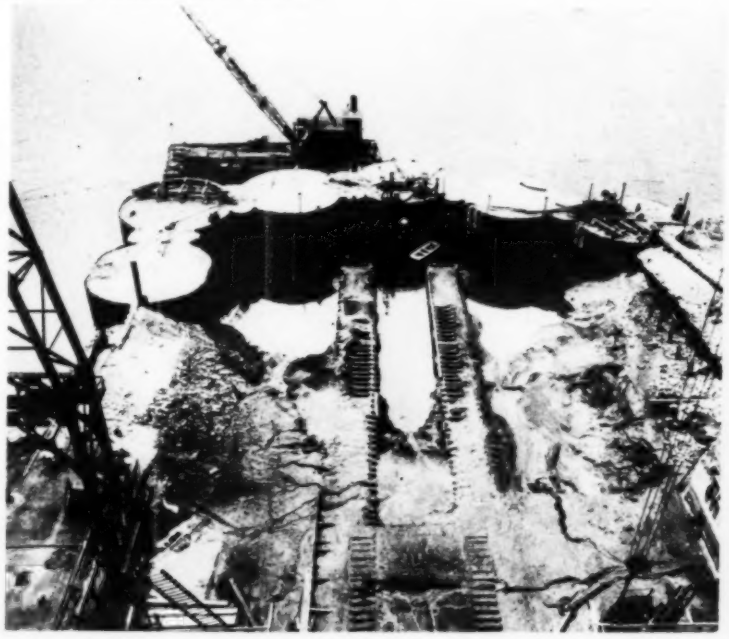
BIG STEEL-FRAME HANGAR (right) at Lowry Field, Colorado, is built with aid of guy derricks.



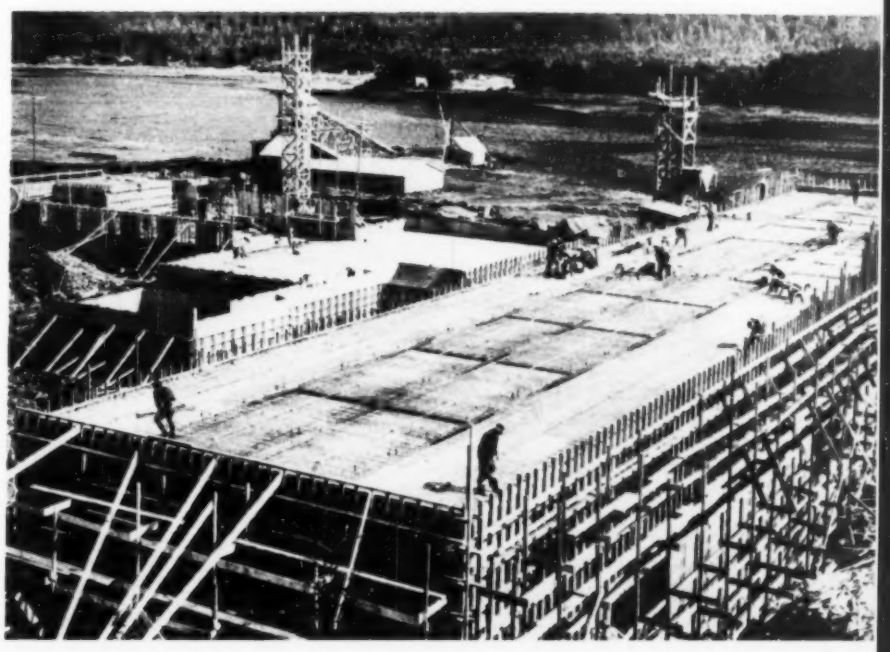
NATIONAL DEFENSE

NAVY

Official Photos, U. S. Navy

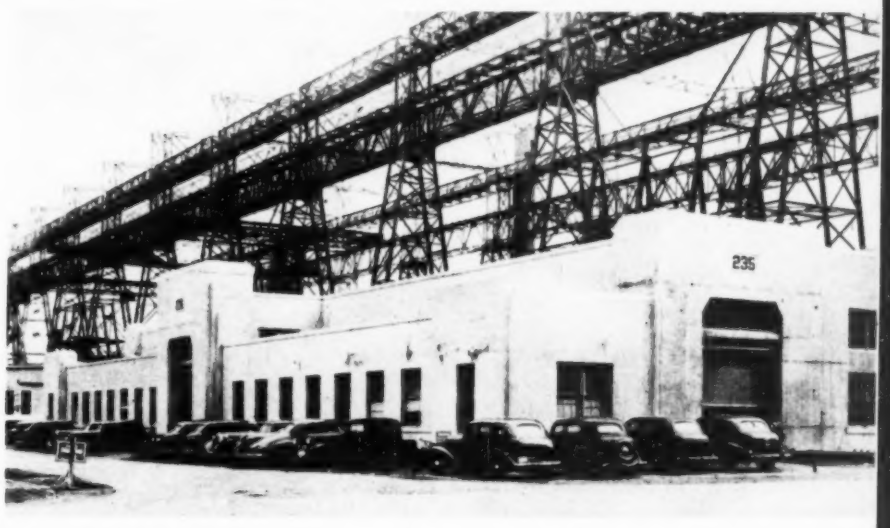


STEEL SHEETPILE CYLINDERS form cofferdam for construction of shipways for Navy Department.



NAVAL AIR STATION, where pouring of concrete for first-floor slab of ness hall and brig is in progress.

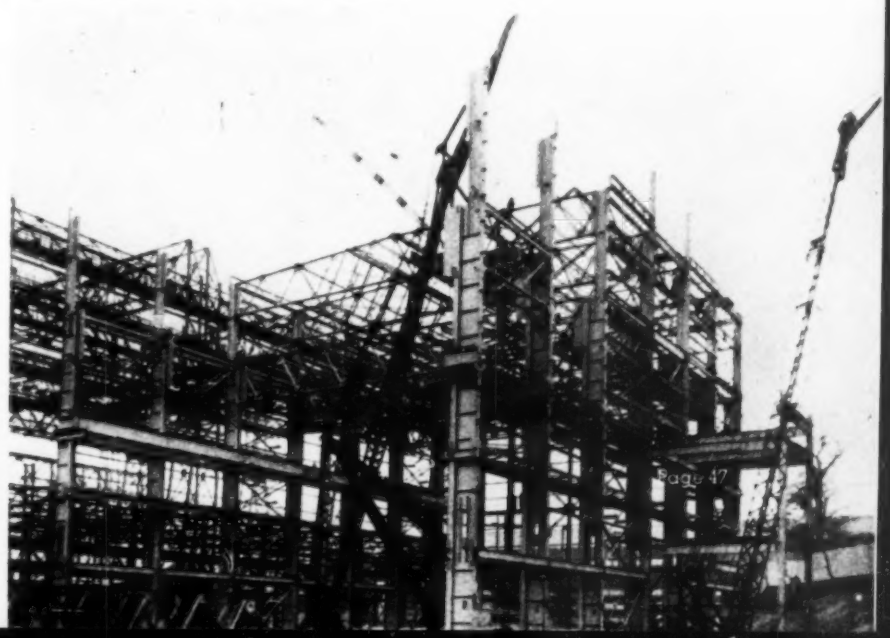
INDUSTRIAL STOREHOUSE, with railroad track canopy in foreground, recently completed at Navy Yard.

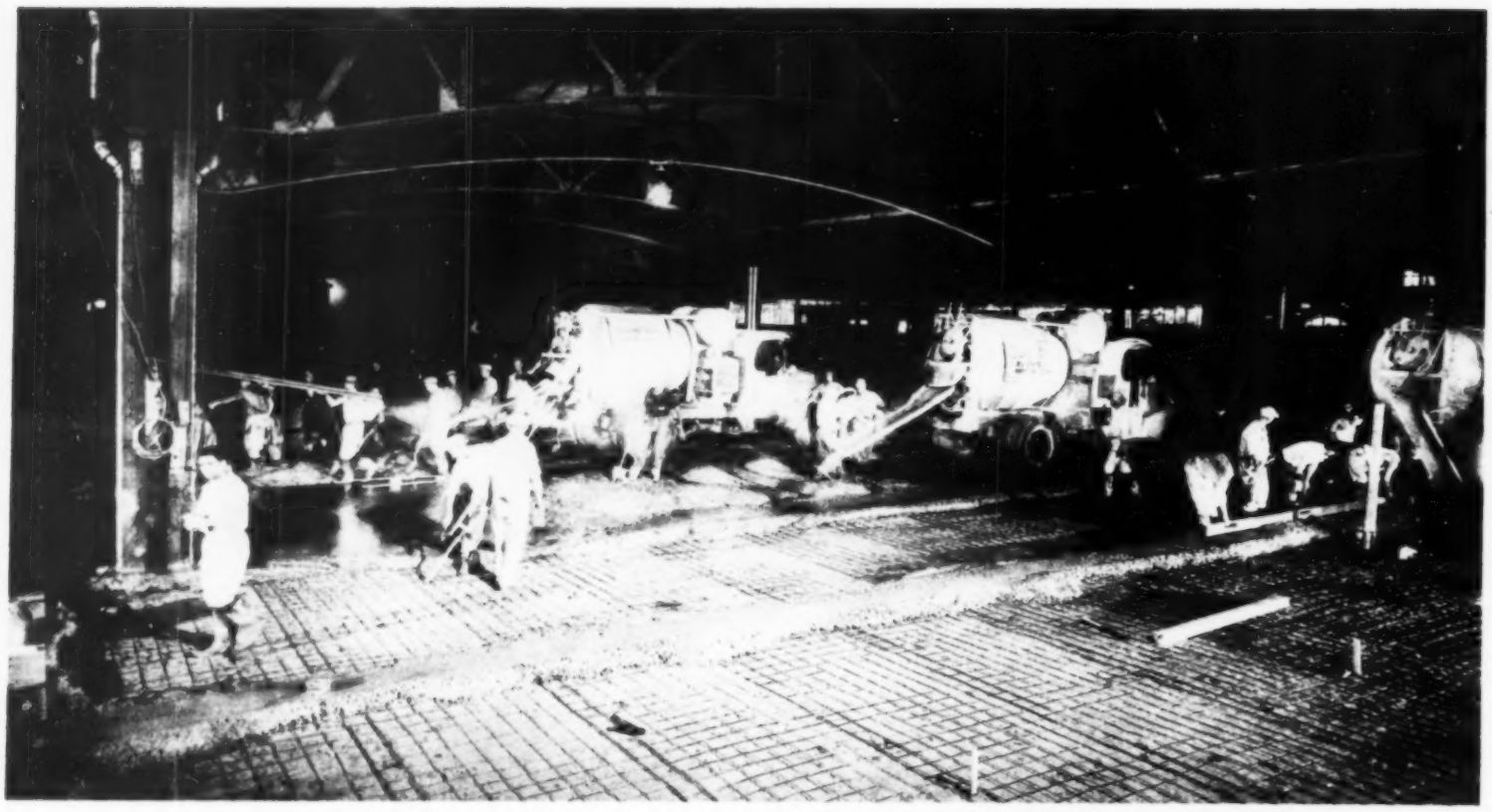


DOCK SERVICES BUILDING of concrete construction, with craneways in background, at Navy Yard.

SEWER OUTFALL (below) is built as part of service facilities at Naval operating base.

LONG-BOOM CRANE and stiff-leg derrick **(below)** erect steel for Navy Yard turret and erection shop buildings.





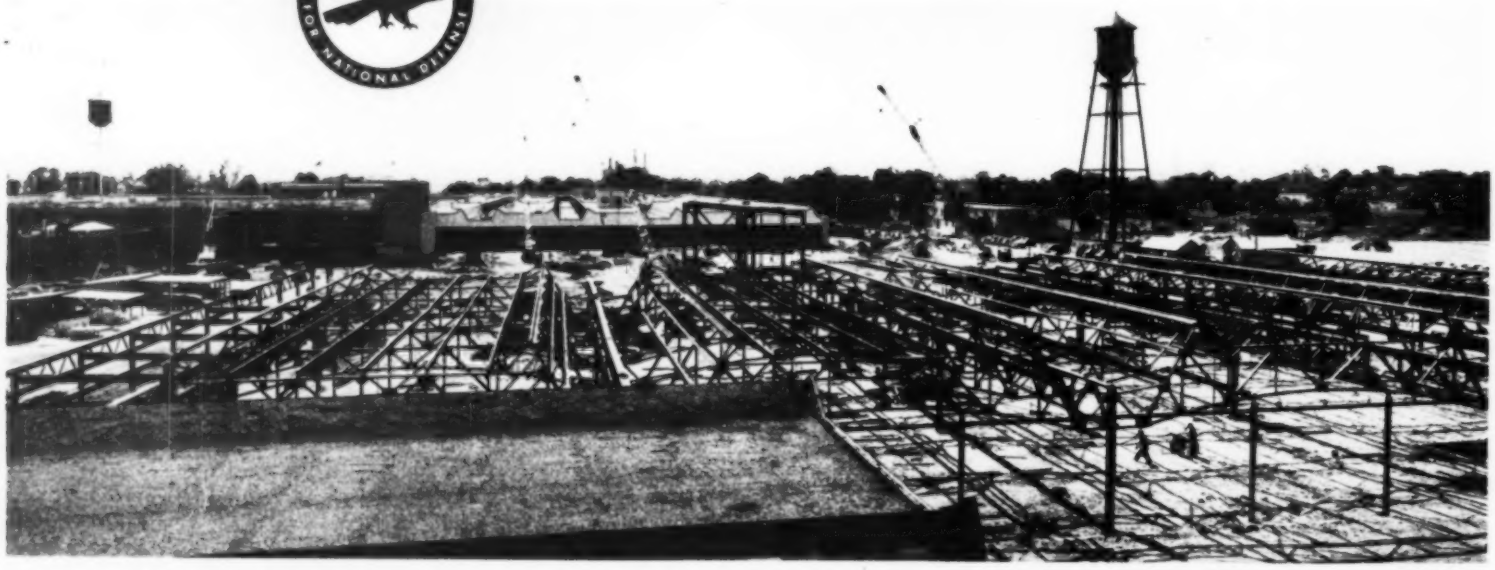
WORKING AFTER REGULAR HOURS, truck mixer fleet is able to deliver full capacity of concrete plant for paving of 5-in. floors reinforced with wire mesh. After setting grade stakes with nails adjusted to grade, concrete slab crew first straightedges and darbies to grade strips of concrete deposited from truck mixers. Using these strips as guides, intermediate areas are filled in and finished to grade.

Twelve-Week Schedule

COMPLETES 8½ ACRES OF ADDITIONS TO *Aircraft Engine Factory*

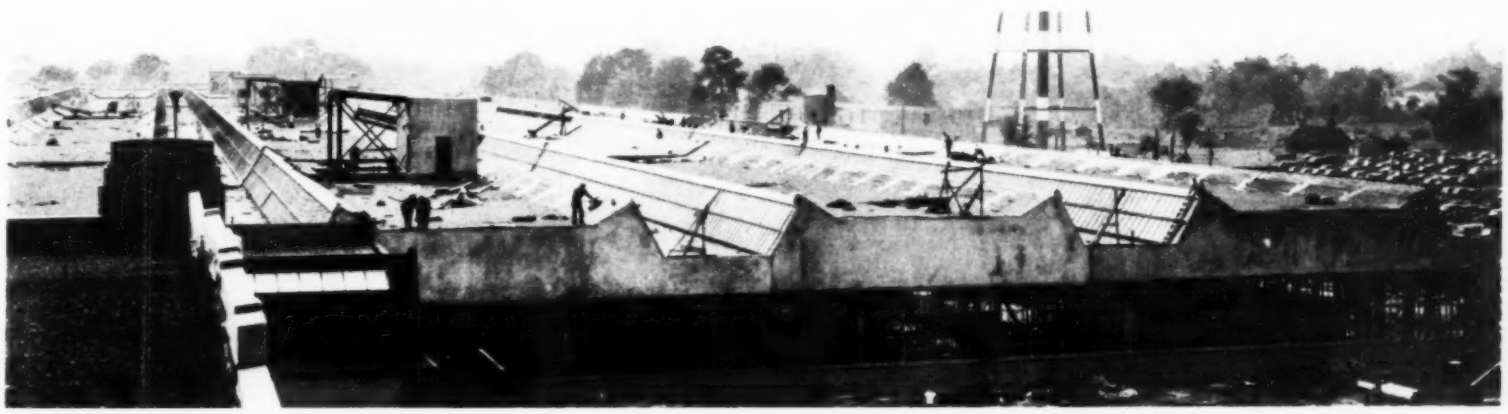
GAINING THE ADVANTAGE of a head start by virtue of plans completed months in advance as part of an Army and Navy preparedness program, the United Aircraft Corp. was able to make speedy awards of contracts for steel and general construction of two additions totaling 8½ acres to the Pratt & Whitney engine factory, East Hartford, Conn., thus giving the job an initial impetus which the Turner Construction Co., general contractor, Boston, and the R. C. Mahon Co., steel contractor, Detroit, never allowed to diminish during the 12 weeks the two extensions were being carried to substantial completion. Progress on the two buildings was astonishingly rapid: the owner was given beneficial occupancy of the first 4¼-acre addition at the end of 8 weeks, or 40 working days,

(Continued on Page 50)



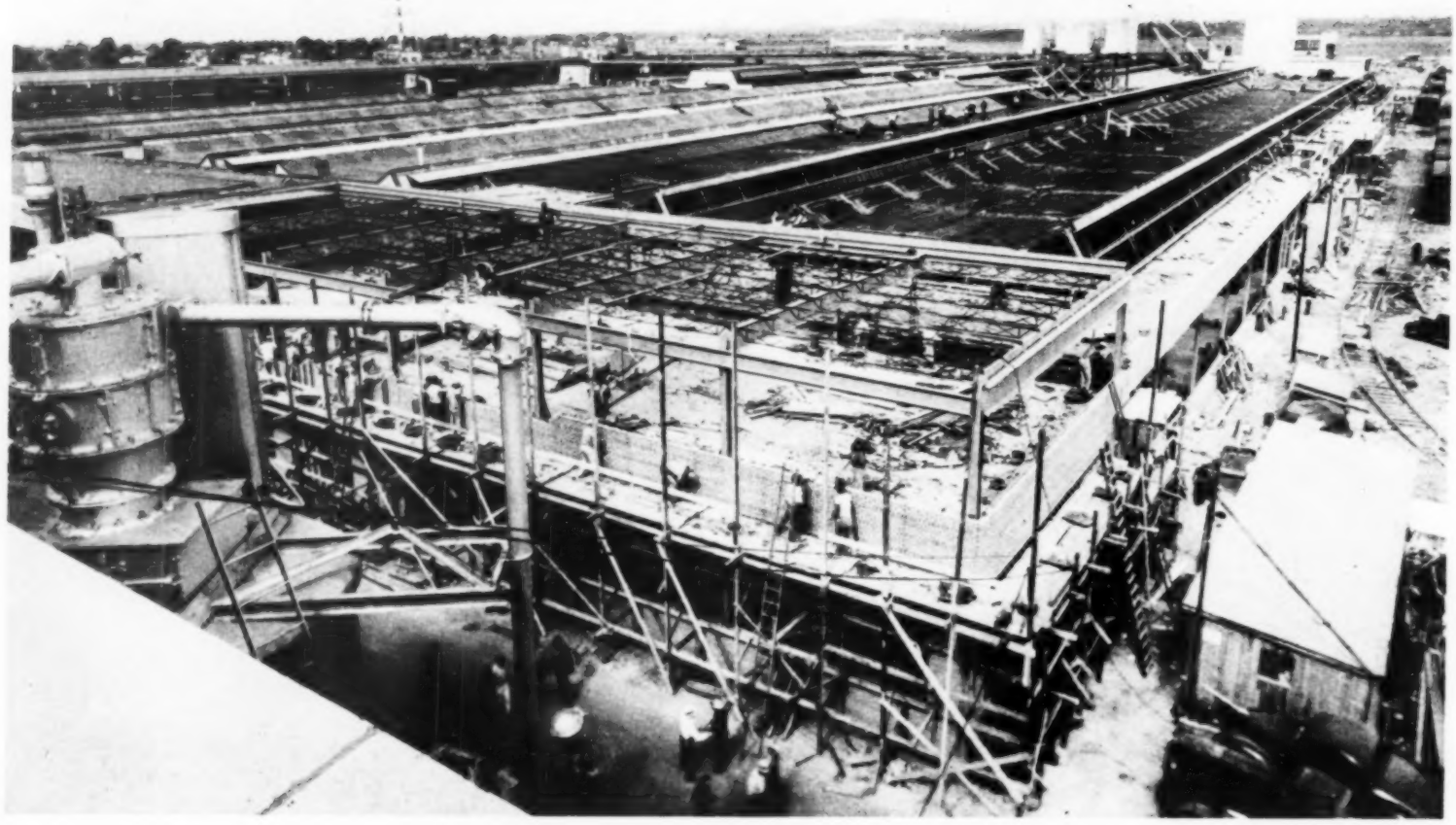
FIRST ADDITION . . . 19TH WORKING DAY. Exactly 7 calendar days after setting first billets and 3 working days after receiving first shipment of columns and framing, steel erector is able to show results of fast work with three long-boom cranes.

FIRST ADDITION . . . 24TH WORKING DAY. As steel framing approaches junction with existing building in background, steel roof deck and built-up roofing are laid on first erected end of structure, in foreground.

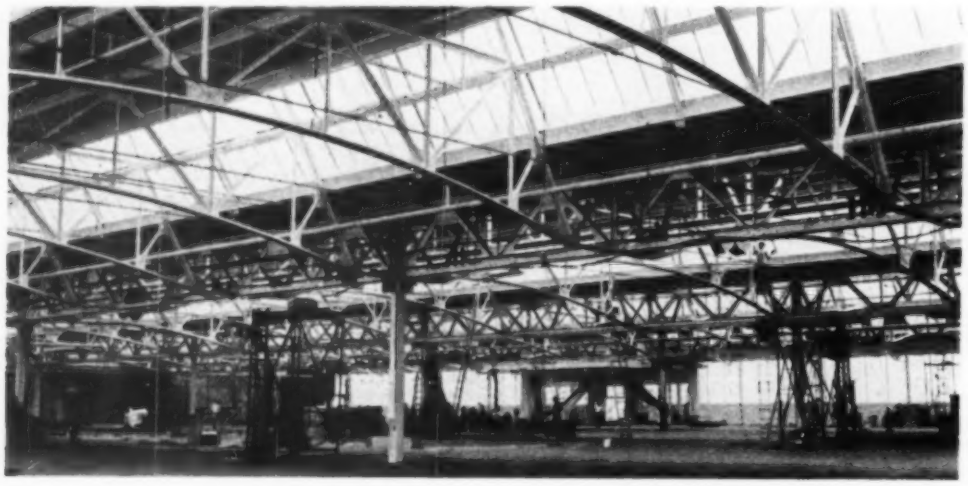


FIRST ADDITION . . . 32ND WORKING DAY. With glazing of side walls and monitor sash completed and with gravel top already in place on large areas of built-up roofing, building exterior begins to assume completed appearance. Gunite walls close ends of monitors.

SECOND ADDITION . . . 27TH WORKING DAY. Truck crane erects special framing for two-story office structure occupying near end of this addition, while two other long-boom cranes handle steel being unloaded directly from railroad siding and erected in typical monitor-type roof frame, featuring bowed transverse trusses, in background. White steel columns in outside wall of new building are reused columns removed from side wall of existing structure, which is temporarily supported by timber shores.



SECOND ADDITION . . . 37TH WORKING DAY. As roofing is laid rapidly on monitor-type factory building in background, construction advances steadily on two-story office section in foreground. Three cranes are still at workerecting structural frame in distance, at far end of factory addition. At this time construction schedule gives 23 more working days in which to complete second unit.



TYPICAL BAYS measuring 64x64 ft. between columns are amply lighted by monitor sash facing north and south. Coolite, a special blue glass, acid-etched both sides, is used in the south monitor sash to reduce glare and heat transmission. Messenger wires hung from roof purlins support lighting conduit.

and the unit was substantially complete, ready for the installation of machine tools and other equipment, by the end of the ninth week. Only 3 additional weeks were required to bring the second extension, of equal area, to substantial completion on the 60th day of actual construction, at the end of the twelfth week.

Plans for the two additions originally had been drawn at the owner's order during the preceding November and March by Albert Kahn, Inc., Detroit, architects and engineers, and had been filed for possible later use. In making the advance plans, the United Aircraft Corp. was acting in accordance with tentative suggestions for future needs set up by the Army and Navy preparedness program. When a decision to build was made late in May, the owner

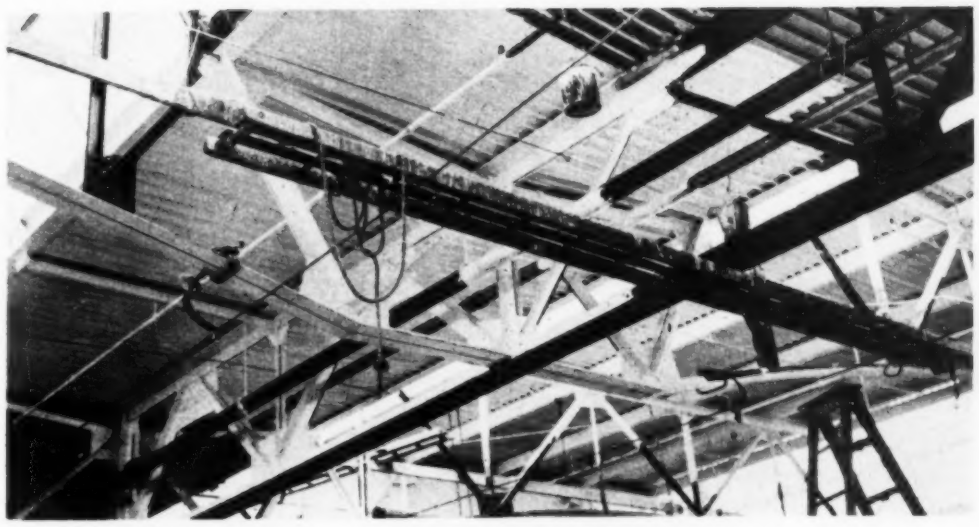
STREET FACADES of factory additions have buff brick curtain walls and sills and copings of limestone or cast-in-place concrete. Rear walls are common brick and Gunite. Two additions inclose total floor area of about 400,000 sq. ft.

was able to take bids for structural steel quickly and to order the steel by telephone to Detroit on May 23. Fabrication and delivery of steel formed the critical factor in a rapid construction schedule and required precedence in the placing of orders.

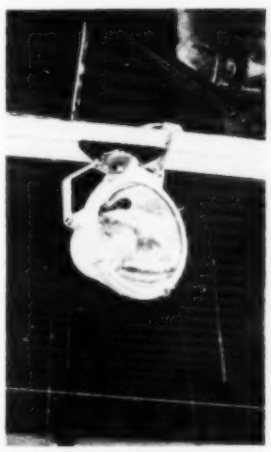
General construction bids were taken from at least five contractors, and oral award of the contract was made by telephone to the Turner Construction Co. on the afternoon of June 5. Plans for estimating bid prices had been furnished to the Turner Construction Co. and to other general contractors on May 29, and all bids were submitted in time to permit the award 7 days later. Turner's field superintendent arrived at the site late in the afternoon of June 5 and began lining up workmen and organizing the job on the following day, Thursday, June 6; actual construction operations started on Monday, June 10.

Fast Progress — A notable feature of the rapid construction progress was the fact that the entire job was completed on the basis of a normal 5-day 40-hr. work week, with the exception of a second shift employed during part of the operation to place concrete floor on soil subgrade after 6 p.m., thus taking advantage of improved highway traffic conditions during the early hours of the night. Beneficial occupancy of the first addition, allowing equipment to be moved on to the floor, was given to the owner on Aug. 3, and the building was substantially complete by Aug. 10. The second extension was substantially complete by Aug. 31, 60 working days, or 87 calendar days, after the contractor received oral notice that the award was to be made. Electric power

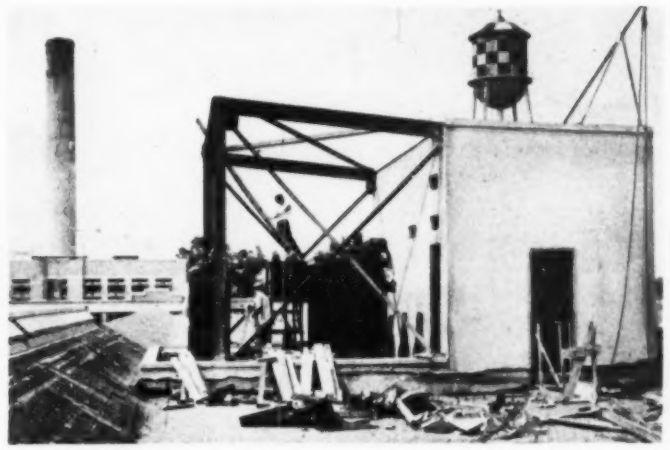
(Continued on page 87)



SUSPENSION CABLES support movable ladder used as scaffold by painters



POWERFUL FLOODLAMPS borrowed from factory parking field provide ample lighting for placing floor slab concrete at night.



TRANSFORMER SUBSTATIONS are placed on roof to save space inside building.

DOUBLE HOOKS on pipe handle, devised by electrical contractor's foreman holding tool, simplify handling of 2,000-amp. bus sections weighing 650 lb. each.

ACCORDION-TYPE COPPER FLASHING over roof expansion joint will be covered with hinged wooden plates forming permanent flexible protection.

DUSTPROOF PARTITIONS of plywood lined with reinforced waterproofed two-ply kraft paper separate construction areas from factory buildings to which extensions are being added.

JOB YARD BUILDS 7,200 ROOF TRUSSES WITH *Production Line Methods*

PRODUCTION LINE. ordinarily manned by seven operators, does cutting, boring and grooving of roof truss members.

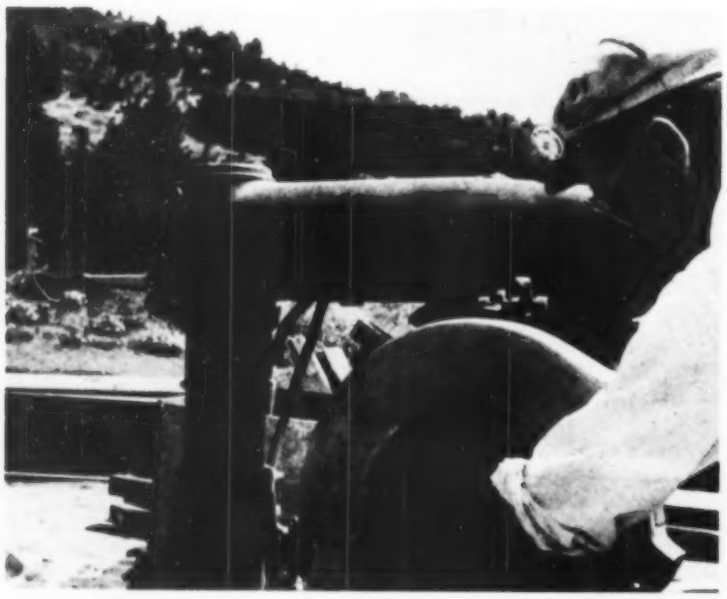
ROOF TRUSSES OF WOOD, some 7,200 of them, for 27-ft. spans, constitute an item in construction of the Sunnydale Housing Project at San Francisco where 772 family units are being constructed in 400 days. Concrete predominates as a construction material in the buildings, but wood is used for partitions and roof trusses, and quantity production methods have been worked out to keep costs down. The premium on effective design is illustrated by the fact that one additional ¾-in. bolt in each roof truss would make a difference of $700 in the total cost.

In the fabrication yard on the job, endeavor has been made to simplify operations as much as possible and to give the workmen every mechanical aid. The roof truss assembly operation reflects the close figuring on quantity production which made the difference between the original $3,000,000 estimate for the job and a low bid of $2,100,000.

The project is financed on the basis of a 60-yr. life expectancy. The buildings are designed to resist earthquake forces of 0.1 g., necessitating rigid fastening together of different parts of the structures.

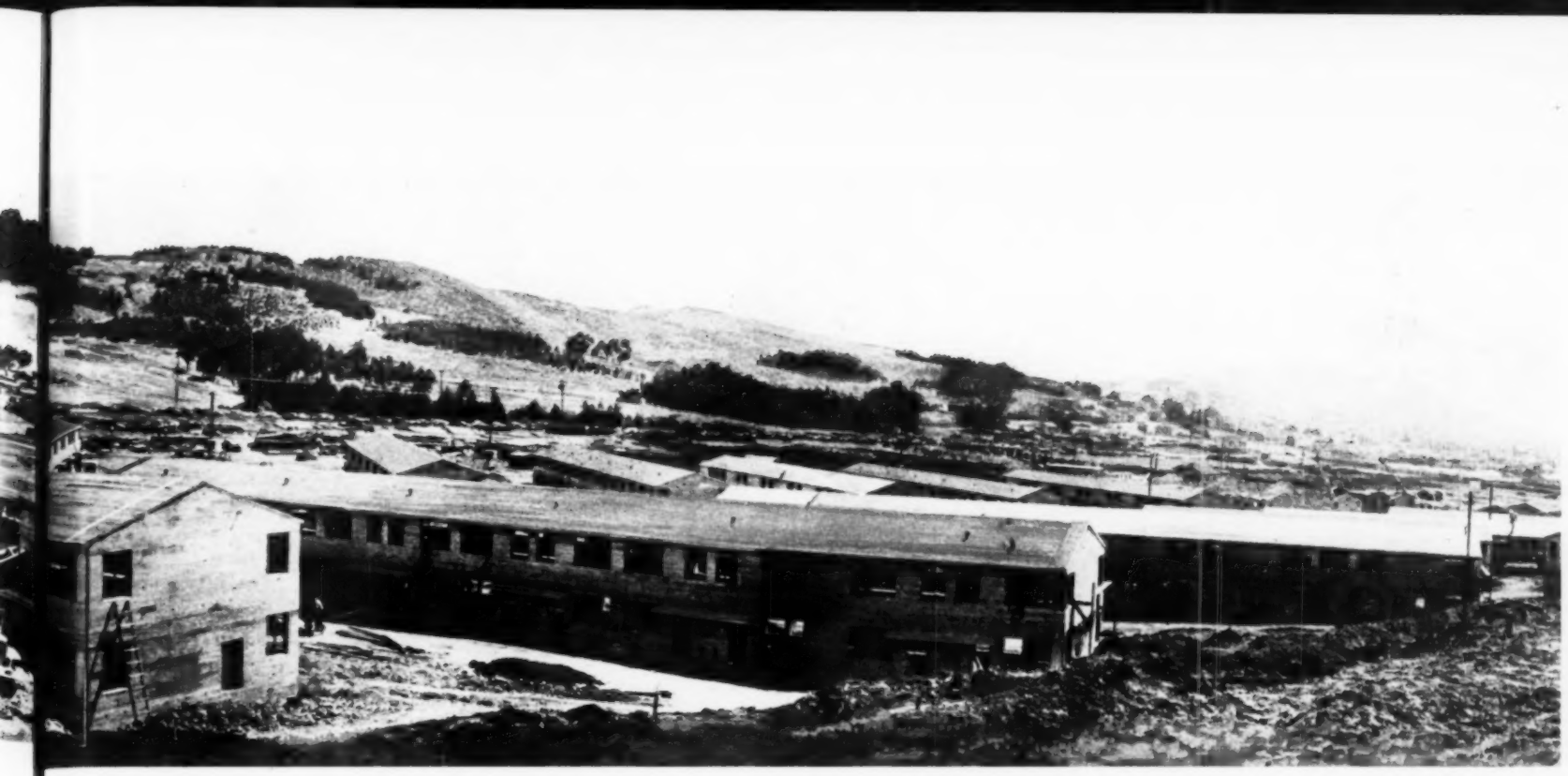
In the roof trusses the three main joints are made with metal ring connectors and ¾-in. bolts. Rafters are 2x6 in., and other members of the truss are 2x4 in., all Oregon pine.

(Continued on page 98)



FIRST TWO MACHINES are circular saws, like this one, simultaneously cuting both ends of member.

PORTABLE ELECTRIC SAW. operated here in two separate guides, makes two bevel cuts that form notch for fitting rafter to plate. After first cut, operator transfers Skilsaw to other guide and makes second bevel cut.



SUNNYDALE HOUSING PROJECT makes rapid progress during first 3½ months of construction, as indicated by wood frame roofs already completed on reinforced-concrete row houses in this corner of site.

TWO HEAVY-DUTY ¾-IN. DRILLS are used simultaneously on opposite ends of rafters. Each Van Dorn unit drills bolt hole and cuts circular groove for ring connector in one operation.

ROOF TRUSSES are set on 2-ft. centers, with nailing strips attached to underside and inspection walkway laid on tops of bottom chords.

COMPLETED ROOF TRUSSES are stacked in piles of seven, ready to be moved to buildings by lumber carriers.

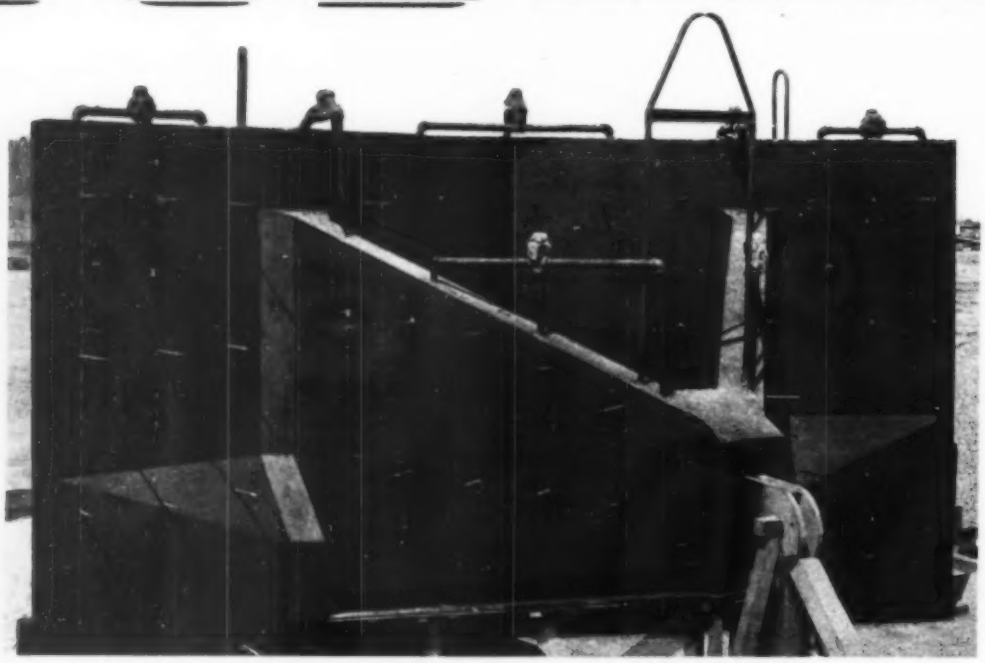
WITH TRUSS ASSEMBLED ON JIG, Van Dorn electric "nut runner" turns up nuts in ring connector joints.

BIG AS A HOUSE is this 50-ft. section of sidewall and arch form, 30 ft. high, used in concreting tunnels for railroad relocation being built around Shasta reservoir, U. S. Bureau of Reclamation project in California's Central Valley. Window-like openings in walls allow concrete to be poured from inside to form lining about 1 ft. thick. Form is being moved to new setup by truck of G. W. Thomas, San Francisco haulage contractor.

CHIP OFF THE OLD BLOCK is 3½-year-old Marcus Ming, Jr., son of Marcus Ming, road superintendent of Bolivar County, Mississippi, who operates 1½-hp. miniature tractor alongside Caterpillar diesel D7 unit which his dad drives. Little tractor is equipped with single-cylinder gas engine and has top speed of 2 m.p.h.

odd oddities

LOAD OF 82½ TONS, in form of press head for one of big automobile manufacturers, is moved by Art Brockman, trucking contractor, of Detroit, Mich., on 50-ton drop-deck Rogers trailer, with main beams specially reinforced.



ANCHOR OF ODD DESIGN (left), made of reinforced concrete and weighing 65 tons, is sunk in soft bottom of Lake Washington, at Seattle, Wash., to moor 7,721-ft.-long floating bridge, consisting of cellular concrete pontoons, recently completed by Pontoon Bridge Builders. From an eyebar in embedded anchor a 2¾-in. wire rope cable extends to fastening within pontoon. To each of 41 anchors of this type water jets and hose lines are rigged to help anchor sink deep in mud bottom of lake. Anchors of two other types are used for harder bottom material.

Belt Conveyors FOR CONSTRUCTION OPERATIONS

HUGE ROLLS OF BELTING await installation in 9.6-mi. conveyor at Shasta dam, in California. As supplied by Goodyear to Columbia Construction Co., belting 36 in. wide will carry capacity load of 1,100 tons of material per hour. Total weight of belting for long conveyor system is 1,500,000 lb.

THERE ARE VERY FEW construction operations where belt conveyors in some form are not used. The transfer over short distances of sand, gravel or concrete is a very simple operation when using belt conveyors and requires a degree of skill considerably less than that involved with other methods. Where longer distances are involved the problem is purely one of economics. If the volume to be handled is very great and the period of time within reasonable limits, the high first cost of a belt conveyor is offset by its greatly simplified operation. This has been demonstrated recently on many important earth-moving projects.

The elements of a conveyor system are: Rubber belting, carrying idlers, return idlers, head pulley, tail pulley, belt tightener or take-up, motor drive and driving gears, and necessary supporting structure or trusses. The most important problems in the design of a conveyor system are frequently centered in the proper feeding, transferring and discharging of the materials to and from the belt.

For a given problem involving the movement of an estimated volume of material per day it is customary to con-

"CONSTRUCTION PLANNING AND PLANT"

A NEW MANUAL FOR CONTRACTORS AND ENGINEERS

● **Readers of "Construction Methods" will recall the series of articles by A. J. Ackerman and Charles H. Locher which appeared in 26 installments in this magazine from November, 1935 to March, 1938 under the head "Planning and Plant for Heavy Construction." Written by and for practical construction men, and containing a wealth of information on methods and equipment which had not previously appeared in print, these articles elicited from engineers and contractors a widespread interest, reflected by a flood of correspondence requesting extra copies of issues carrying individual chapters of the series and suggesting that the complete series be assembled in reprint form as a permanent reference manual.**

● **To meet this demand Mr. Ackerman has made a thorough revision and amplification of the articles which are now available in the form of a 381-page book "Construction Planning and Plant," just published by our associate organization, the McGraw-Hill Book Co. To the articles appearing originally in "Construction Methods," Mr. Ackerman has added a considerable amount of new material, including a chapter on "Belt Conveyors," reproduced, in part, herewith. — *Editor*.**

"AIRPLANE" DISTRIBUTOR (below) on belt conveyor system serving stock piles at Fort Peck dam in Montana.

Photo, Jeffrey Mf'g. Co.

Now it's 16 FOR P AND B

BIG WEST COAST OPERATORS STEP ALONG WITH 2-CYCLE DIESELS

A demonstration PROVED HD-14's dirt-moving ability—started the ball rolling! Two were ordered immediately . . . then seven! More added as more jobs were hit! 16 HD-14's to date for Parker-Schramm and Eaton & Smith—7 at Walla Walla, Washington; 5 at Scappoose, Oregon; 4 at Deer Island, Oregon. Big capacity scrapers, up to 28 yd. size, are hauled and pusher-loaded with the HD-14's.

Try them . . . on your job . . . under your own operating conditions! We'll gladly arrange a demonstration.

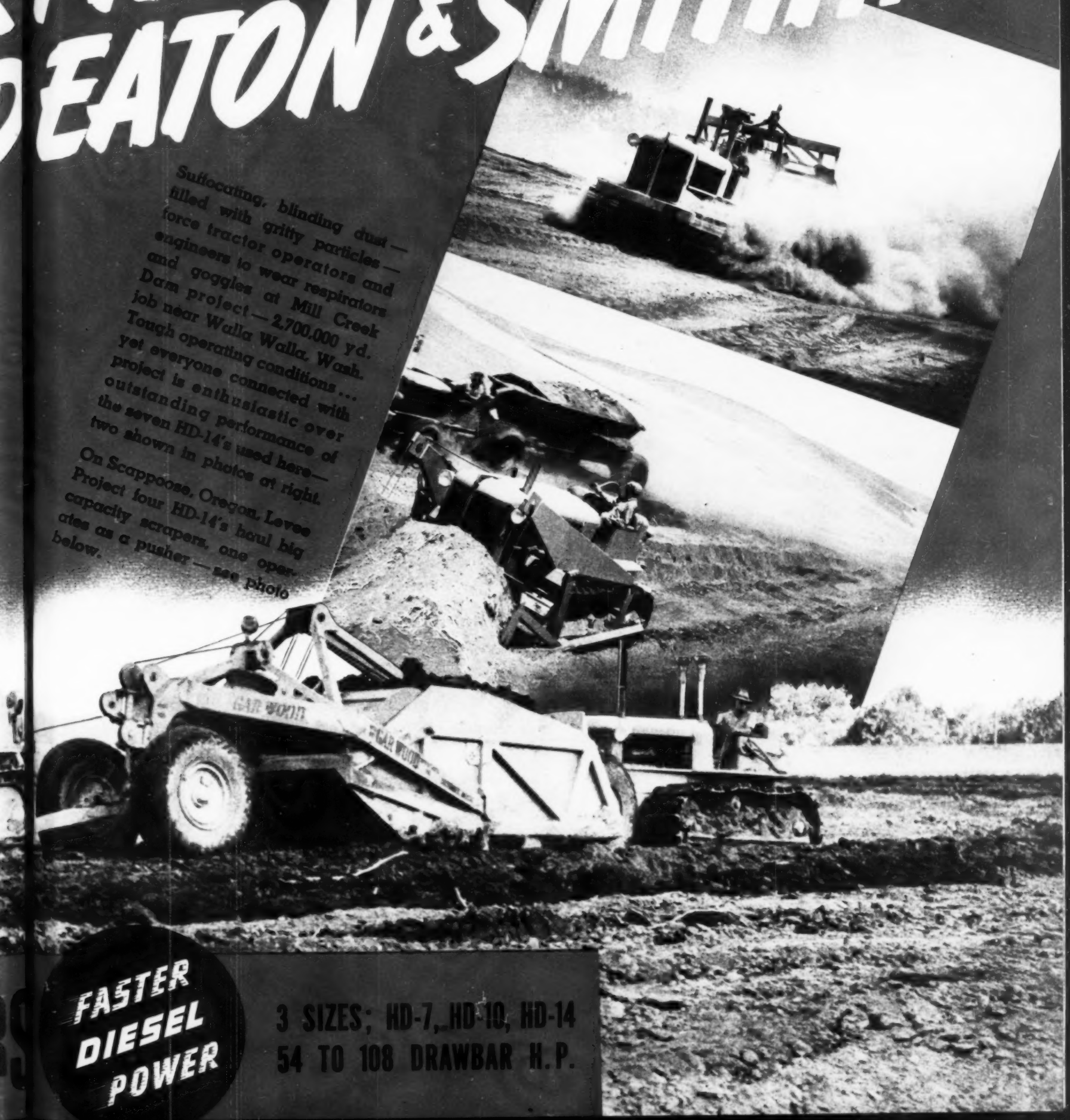
ALLIS-CHALMERS

TRACTOR DIVISION—MILWAUKEE, U.S.A.

PARKER-SCHRAM EATON & SMITH...

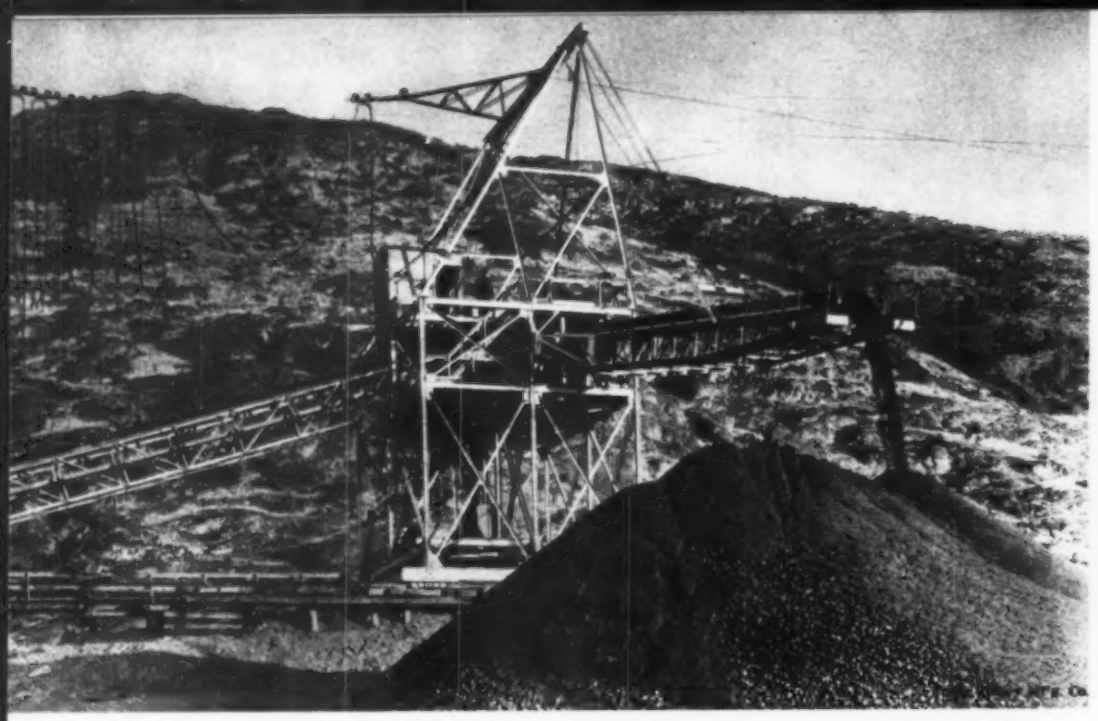
Suffocating, blinding dust — filled with gritty particles — force tractor operators and engineers to wear respirators and goggles at Mill Creek Dam project — 2,700,000 yd. job near Walla Walla, Wash. Tough operating conditions... yet everyone connected with project is enthusiastic over outstanding performance of the seven HD-14's used here— two shown in photos at right.

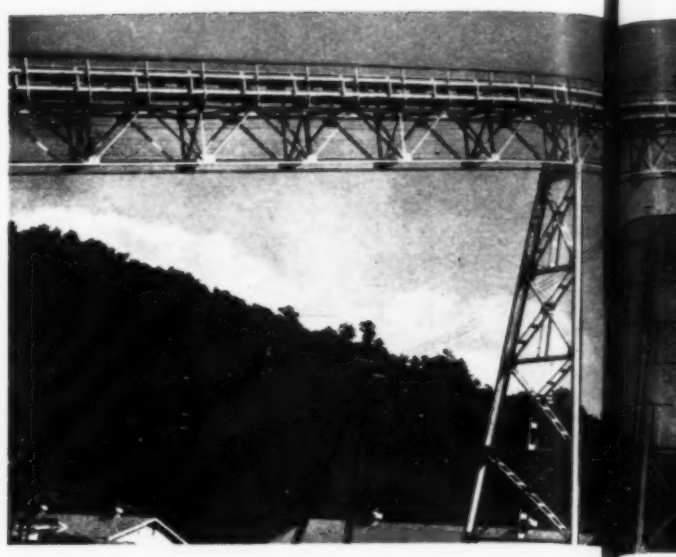
On Scappoose, Oregon, Levee Project four HD-14's haul big capacity scrapers, one operates as a pusher — see photo below.



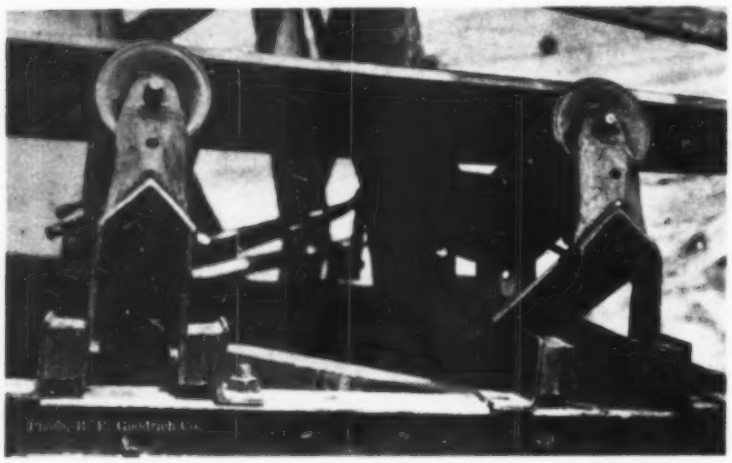
FASTER DIESEL POWER

3 SIZES; HD-7, HD-10, HD-14
54 TO 108 DRAWBAR H.P.





"AIRPLANE" TRIPPER diverts flow of aggregates from belt conveyor to stockpiles at Grand Coulee dam on Columbia River in Washington.



SHOCK-IMPACT MOUNTINGS carry belt conveyor at Friant dam in California.

FOR DELIVERING CONCRETE to forms for sewer tunnel in Chicago this inclined belt conveyor **(below)** handled 120 tons, or 60 cu.yd. per hour for Michuda Bros. Construction Co.

CRUSHED ROCK for state highway project at Cullman, Ala., is sized and transported with aid of three 24-in. wide belt conveyors.

MOVABLE CONVEYOR (below) on skid frame 600 ft. long carries 36-in. wide belt and is equipped with two traveling hoppers for receiving earth and rock loaded by power shovels. Capacity 675 tons per hour.

AGGREGATE CONVEYOR with length of 520 ft. serves live storage bins of concrete mixing plant at Guntersville dam, Tennessee Valley Authority project in Alabama.

vert this to tons per hour as the first step in designing a conveyor layout. The performance of the belt is usually based upon the assumption that it carries uniform loads. This, however, may lead to an unsatisfactory solution because it is almost impossible to maintain a uniform feed to the belt, and for the various conditions of irregular feeding, underloading and overloading it is necessary to make a substantial allowance and design the belt with an ample reserve capacity. For example, if it has been established that 250 tons per hour are to be moved, then the physical and mechanical features of the belt-conveyor system should be designed to carry a uniform load of about 350 tons per hour.

The angle of inclination at which bulk materials may be handled by belt conveyors depends upon the nature of the material. Twenty degrees is ordinarily considered the maximum. The angle of inclination is also dependent to a considerable extent upon the speed of the belt and upon the method of feeding material to the conveyor. If the material is fed to the belt in the same direction and at approximately the same speed as the belt travels, slightly steeper inclinations may be employed.

The following tabulation of angles with respect to the horizontal applies to average conditions:

ANGLES OF INCLINATION OF BELT

MATERIAL	ANGLE, DEG.
Sand and gravel, unscreened, damp or dry	20
Sand and gravel, unscreened, very wet	15
Pebbles and screened gravel	14 to 15
Dry sand	15 to 16
Moist sand	20 to 22
Crushed stone	18
Mixed gravel, washed	15
Run-of-mine coal	18
Wood chips	27
Concrete, 2-in. slump	20

(Continued on page 100)

CONVEYOR IN TUNNEL underneath stockpile handles aggregate at Grand Coulee dam in Washington.

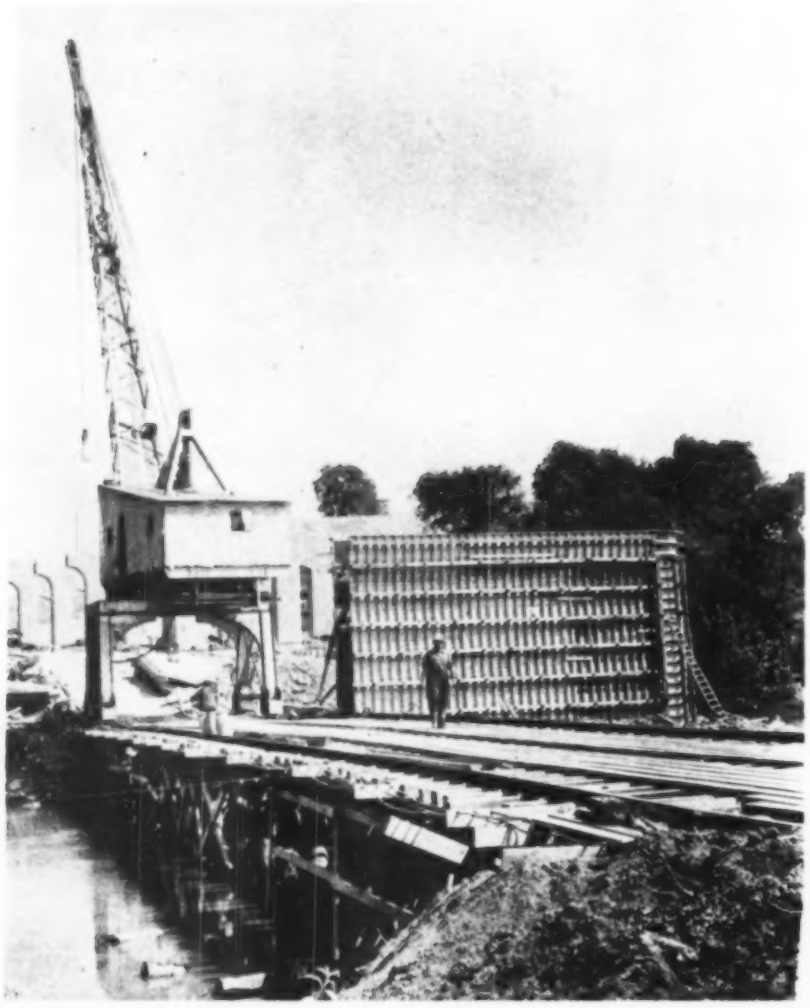
AGGREGATE PLANT at Boulder dam on Colorado River was served by large-scale installation of belt conveyors.

WORLD'S LONGEST CONVEYOR BELT (below) extends over 9.6 mi. of rolling topography to deliver 10,000,000 tons of gravel aggregate for concrete at Shasta dam in California.

HOW They Did It

CONSTRUCTION DETAILS

For Superintendents and Foremen



ELECTRICALLY POWERED WHIRLEY CRANE, mounted on traveling gantry frame to permit trucking across temporary construction bridge, handles forms and concrete for river piers of 520-ft. viaduct built by York Engineering Corp. on Pennsylvania Turnpike across Raystown Branch of Juniata River near Bedford. Wiley crane is equipped with 80-ft. boom to place concrete delivered to buckets by truck mixers.

TO DRIVE 30-IN. PIPE PILES of ½-in. wall thickness into bedrock at depths as great as 170 ft., Western Foundation Co., Chicago, substructure contractor for three Cleveland bridges, fabricates driving heads by arc welding with G-E generators and electrodes.

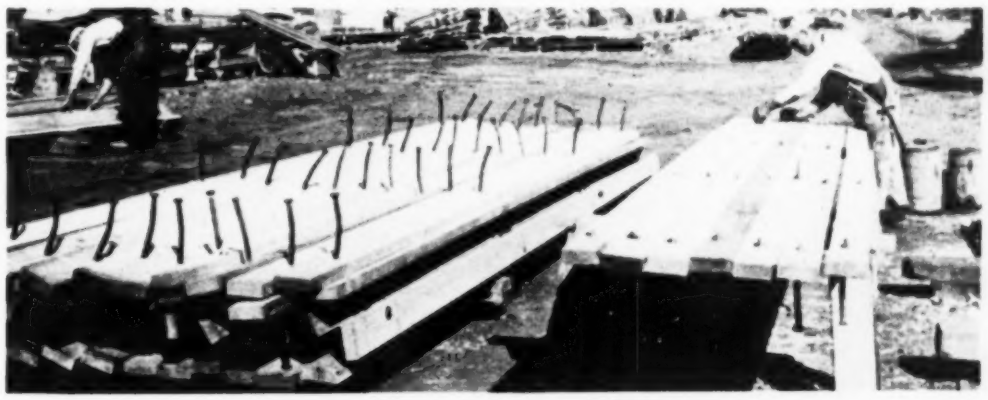
PIPE DETECTOR demonstrated by Ross O. McIntire, Los Angeles, Calif., is electrically operated device used to determine location of buried pipes and thus avoid them when digging holes.

TO PROVIDE FOR CLOSURE of longitudinal joint between 10-ft. lanes of asphaltic concrete paving on 150- to 200-ft.-wide runways at Washington National Airport, Warren Bros. Roads Co., contractor, rolls uncompacted mixture in lane previously laid **(left)** only to within about 12 in. of edge. After adjacent lane has been placed, roller **(right)** closes longitudinal joint by compacting this material along with loose, freshly spread mixture in new lane.

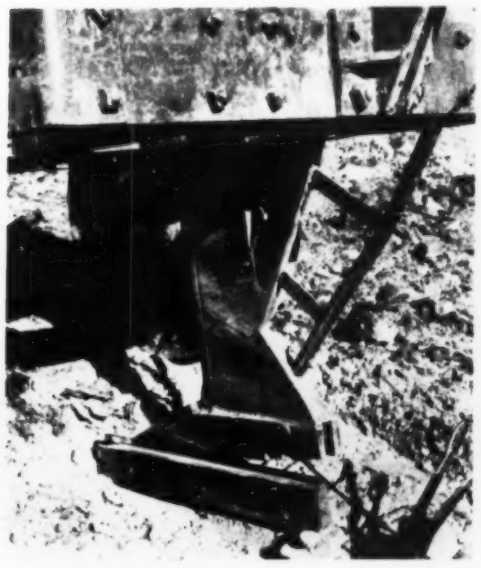
CONTROLLING EROSION on fill slopes of new four-lane divided highway at New London, Connecticut State Highway Department installs treated timber rail at shoulder edge and lines shallow ditch 1 ft. wide with 2 in. of bituminous material shoveled from suspended platform at back of truck **(above)** and spread and tamped to form a gutter **(below)** leading to drop inlets.

MECHANICAL SHAKER aids U. S. Bureau of Reclamation engineers make sieve analyses of sand samples at Grond Coulee dam.

ADJUSTABLE TELESCOPIC METAL SPOUT designed by Charles Inman, master mechanic, replaces awkward canvas spout under bulk cement batching plant of States Engineering Co., Rapid City, S. D., on Pennsylvania Turnpike paving job. Adjustable section of metal spout is to be suspended on counterweighted lines permitting ready raising and lowering to accommodate batch trucks of various heights.



BENT BY SLEDGE to prevent rotation in concrete when nuts are tightened, anchor bolts are installed in 2x6-in. plates which go on top of reinforced-concrete walls of row houses at Sunnydale housing project, San Francisco, Barrett & Hilp, contractors.



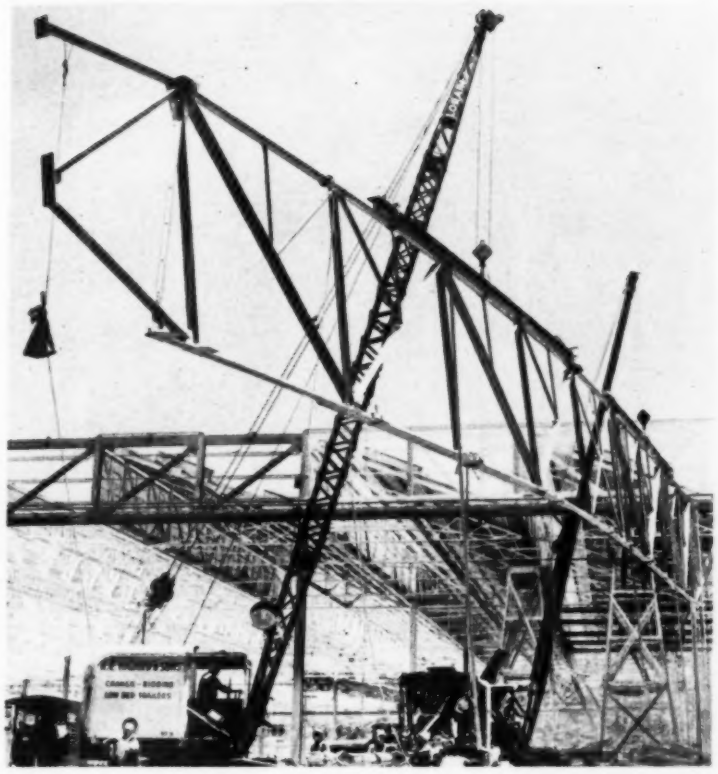
SPECIAL TRACTOR-DRAWN PLOW installs continuous counterpoise wire used in conjunction with two overhead ground wires to protect Parker-Phoenix 161-kv. transmission line against lighting damage in dry country. Continuous parallel counterpoise of ¼-in. black copper rod **(right)** feeds from reel on trailer **(left)** through welded tube on rig and around sheave in heel of plow, which can lay wire up to 26 in. underground. Metal tape on wood block **(right)** indicates that plow exceeds 2 ft. in length.

Aircraft Factory Expansion

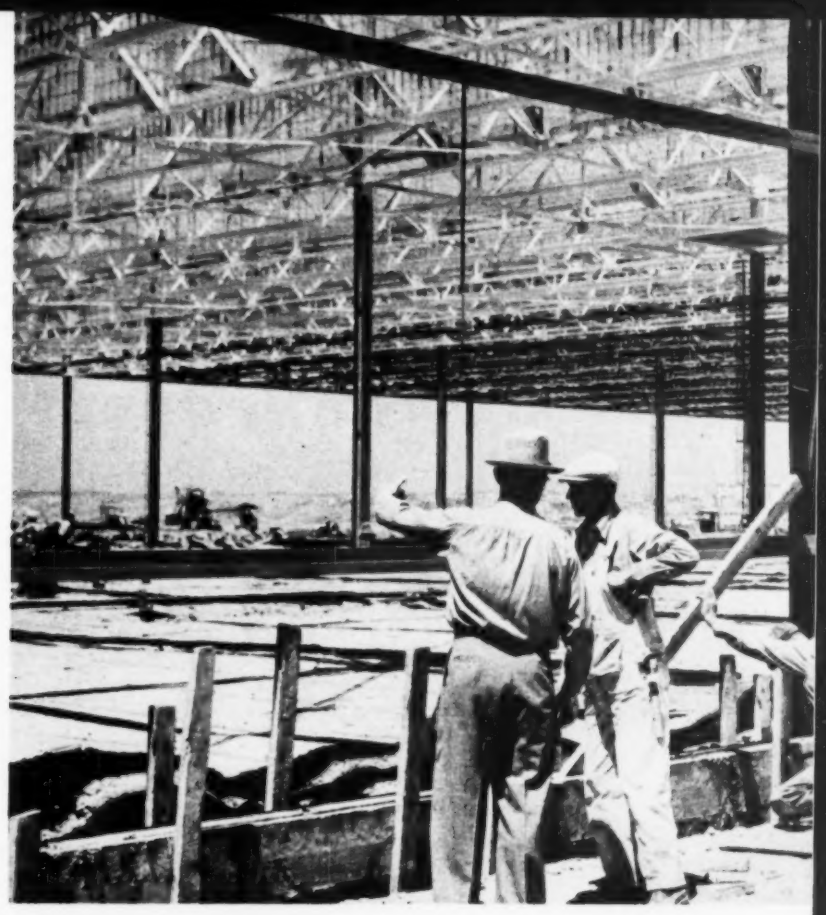
Adds 396,000 Sq. Ft. to Consolidated's Plant in San Diego, Calif.

Official U. S. Navy Photo

NEW FACTORY BUILDINGS (below) and open-air bituminous-paved areas for final assembly operations are features of big program of plant expansion for aircraft production at Lindbergh Field, San Diego, Calif. In upper left corner steel framework is being erected for 360x720-ft. final assembly building. Shed, in foreground, is 1,000 ft. long. **GRADING OF FLOOR** in 360x720-ft. final assembly building **(left)** is done by horse-drawn scraper, prior to pouring concrete slabs. Clear headroom within structure is indicated by crane boom at left. Roof is of sawtooth construction, utilizing north lighting.



STEEL TRUSS ERECTION for final assembly building is handled by pair of truck-mounted cranes. Truss will carry overhead monorail connecting new assembly building and finish building.



OVERHEAD STRUCTURE of large steel building is coated with aluminum paint. Note wide spacing of columns to provide clear floor space.

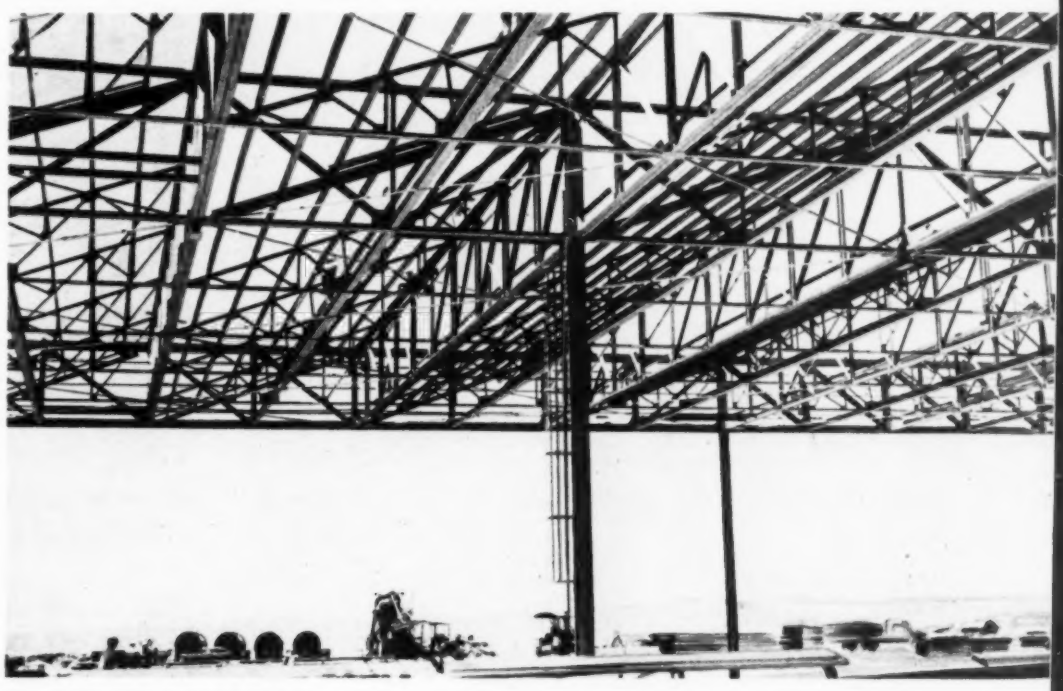
ANNOUNCEMENT WAS MADE by the Navy Department on December 20th, 1939, that the Consolidated Aircraft Corp. of San Diego, Calif., had been awarded a contract for $20,016,699, at that time the largest single order for airplanes ever placed by the United States Government. With work on other contracts occupying most of the production capacity, the record order made it necessary for the company to add new plant facilities to meet the deliveries required by the contract.

Prior to the expansion, Consolidated had under lease 24.7 acres on which factory buildings are located, and an additional 7.6 acres under option. New leases and options now cover an area of 64 acres. This area is all located on Lindbergh Field, San Diego's municipal airport.

The building expansion illustrated in the accompanying photographs, comprising additions to final assembly, final finish, paint shop, wood mill, experimental, maintenance and office departments aggregates approximately 396,000 sq.ft., or an increase in the former area of 87 per cent. The largest single area to be roofed is the new final assembly building measuring 360x720 ft. This has a clear span of 120 ft. and a clearance from floor to roof truss bottoms of 36 ft. Sawtooth roof construction similar to the existing buildings is used. Design of the buildings provides for a minimum of supporting columns, thus leaving floor space clear for manufacturing purposes.

In addition to the buildings, all factory yard areas are paved with asphal-

(Continued on page 108)

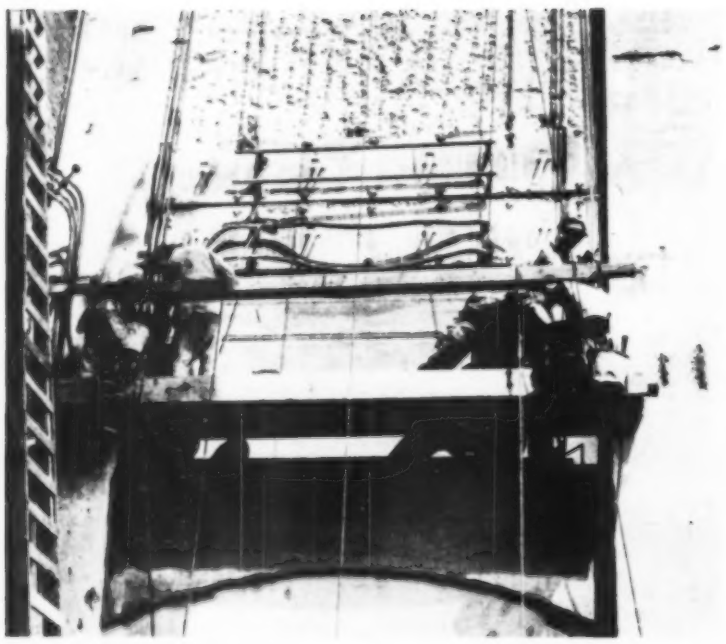


MINIMUM USE OF COLUMNS to support steel superstructure of aircraft factory buildings leaves floors unobstructed for manufacturing and assembling purposes.

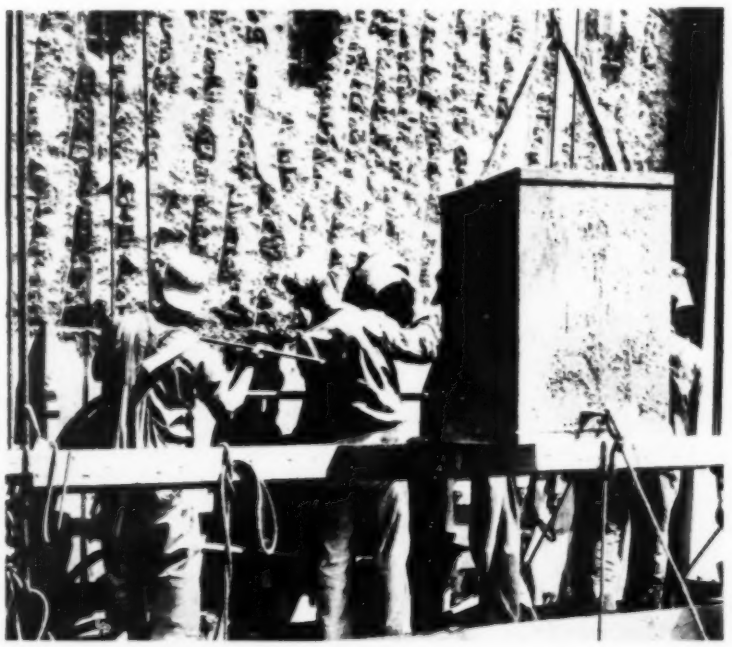
BITUMINOUS PAVING (below) is applied to yard areas where 30 per cent of manufacturing operations may be conducted out of doors due to equable climate of Southern California.

THIN FACING OF STONE CONCRETE APPLIED BY *Vacuum Process*

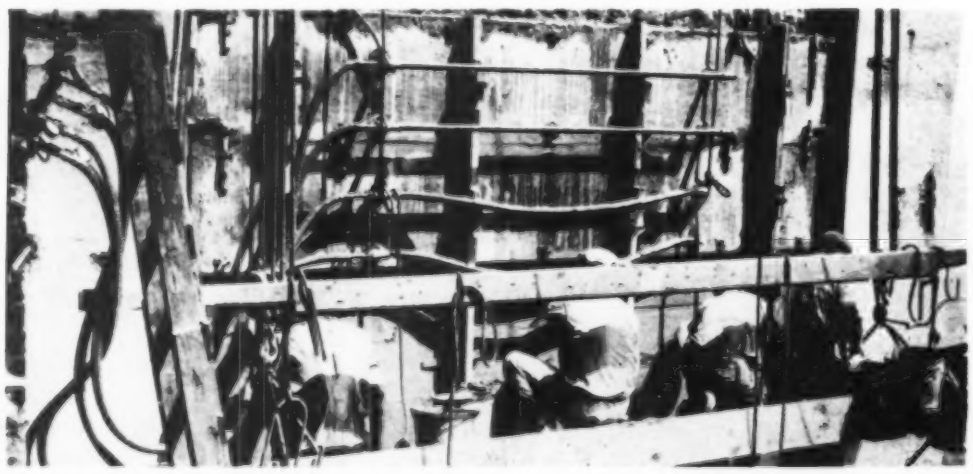
"HARD AS A ROCK." says G. A. VERRILL, Sr., resident engineer, as he feels consolidated sand in rubber bag connected to compressor-operated vacuum system through hose held by ARTHUR P. BEAULIEU, designing engineer, Westcott & Mapes, New Haven, Conn. Enjoying demonstration of what they can do with a vacuum are W. T. GILBERT, at right, vice-president, C. W. Blakeslee & Sons, Inc., and G. A. VERRILL, Jr., at left, in charge of refacing job.



TWO-COURSE PANEL FORM SYSTEM. with upper panel supported by lower, is used in conjunction with vacuum concrete process to reface vertical surfaces of reinforced-concrete bunkers with 2-in. average thickness of stone concrete. Upper panel is hanging suspended in new position, to which it has just been hoisted, while mason-riggers prepare to raise hanging scaffold.



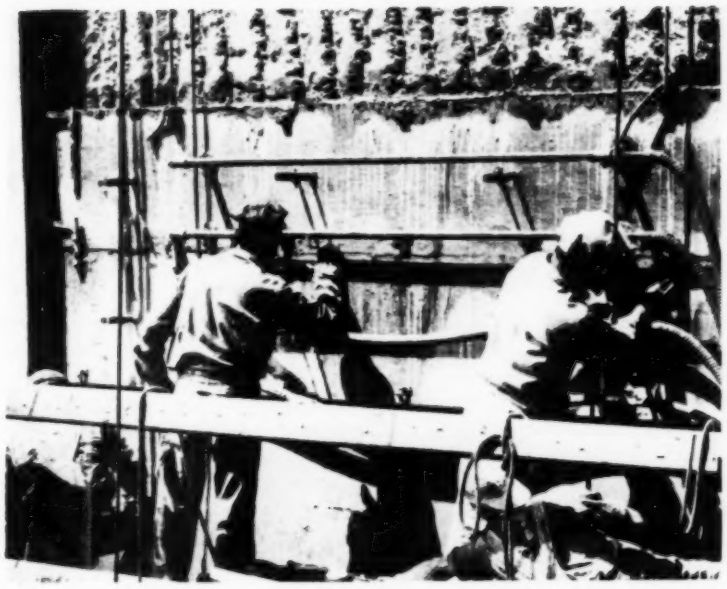
SOUPY CONCRETE hoisted in rectangular bucket is dumped by hand behind upper course panel, supported by studs 6 ft. long (called sky hooks on job) wedged in brackets of upper and lower panels.



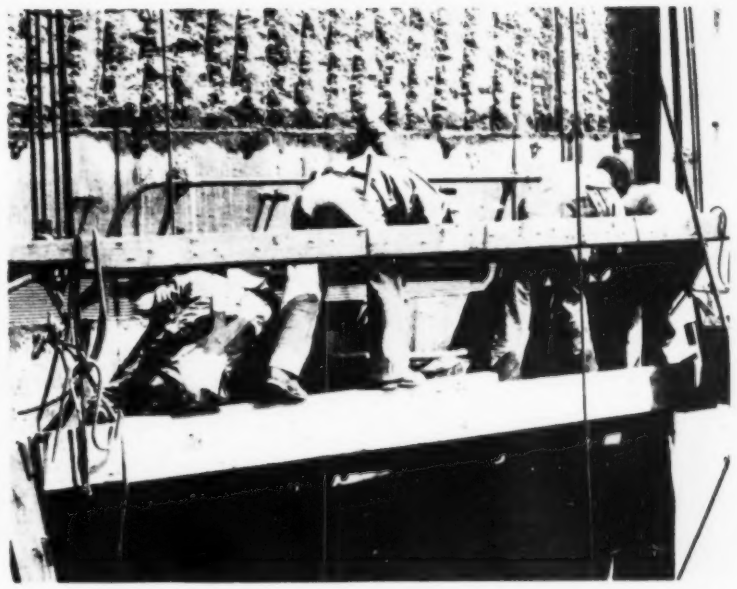
HAVING FILLED UPPER PANEL with concrete and turned on vacuum, cement masons return to finish exposed concrete surface from which panel was removed. Four suction hoses from separate vacuum areas of two form panels are connected to manifold, at left, equipped with individual valves and pressure gages to permit accurate control of vacuum. Note cantilever studs used to support upper form until it can be placed under vacuum.

MAKING A 2-IN. AVERAGE THICKNESS of stone concrete stick to existing vertical concrete surfaces is a trick to test the skill of any contractor, but putting the thin facing in place with panel forms which use atmospheric pressure to hold them in position, and which are ready for stripping in 15 min., smacks more of the imagination than of practical reality. Impossible though the procedure may seem, it effectively served the purpose of C. W. Blakeslee & Sons, Inc., contractor, New Haven, Conn., in refacing 3,600 sq. ft. of vertical surfaces on two ash bunkers at the Bridgeport, Conn., power station of the United Illuminating Co. Accompanying photographs illustrate the contractor's method.

Using a two-course panel form sys-



WITH UPPER PANEL under vacuum, studs and keys are removed to permit release of lower panel.



VACUUM IS SHUT OFF in lower panel to permit stripping form. Checkered surface is imprint of porous rubber filter used experimentally in one of two vacuum mats.

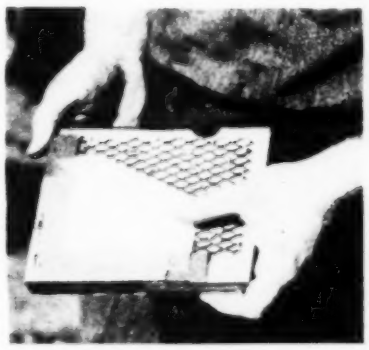
tem in conjunction with the process of the Vacuum Concrete Corp., Philadelphia, with which the contractor had achieved notable success on a number of previous jobs, the concrete crew, working on a hanging scaffold, supported the upper form on the lower panel by means of cantilever studs. The lower panel was held securely in position as the result of a vacuum of 27 in. of mercury maintained on the working face next to the concrete. This vacuum produced a pressure differential of 13½ lb. per square inch acting against the outer surface of the panel. As soon as the upper form had been filled with concrete, it was connected into the vacuum system, placing it under pressure and making it ready to serve as the lower panel for the next lift of facing.

Vacuum Mats

Refacing of the reinforced-concrete bins, which rise 55 to 60 ft. above the truck roadway passing under them, started with flat wall surfaces measuring 12 ft. wide between corner pilasters. To perform the three functions of retaining the concrete, removing the excess water and compressing the thin facing to high density, the contractor made up two 2x12-ft. panels, or vacuum mats, utilizing moisture-resistant five-ply, ¾-in. Douglas fir plywood as the backing for the mat. One of the photographs shows mat construction with a standard fabric filter. On the other mat, the contractor experimented with a porous rubber filter about 1/16 in. thick containing holes of 0.050-in. gage. For ordinary purposes, the fabric filter has proved preferable, because it permits a much larger number of uses between cleanings.

Each panel was divided longitudinally by a center seal strip into two 1x12-ft. vacuum areas. Extending through the plywood backing in each area were two nipples which were connected by a ½-in. special suction hose to the manifold of the vacuum system. With two mats in use, the four hoses from as many vacuum areas were taken care of by a four-part manifold. The manifold, in turn, was connected by 1-in.

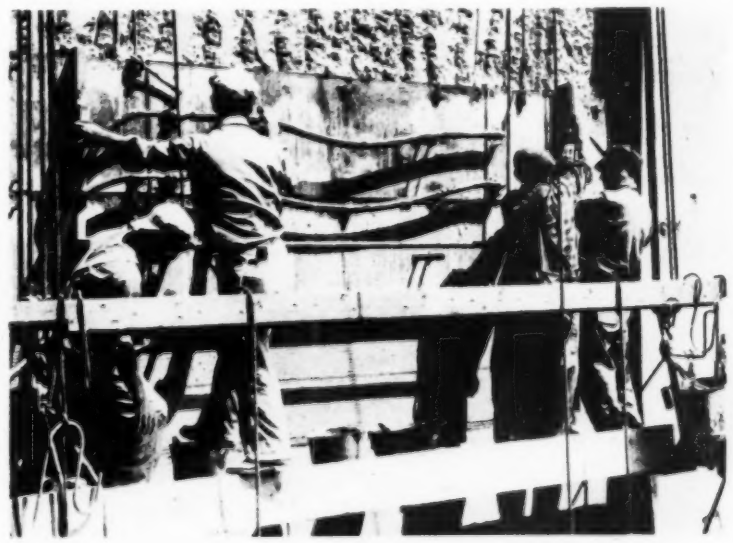
(Continued on page 108)



TYPICAL VACUUM MAT CONSTRUCTION (left) for this job makes use of ¾-in. moisture-resistant plywood backing with ⅛-in.-thick seal strip set into edge. Working area of mat consists of expanded metal lath (for a waterway) overlaid with fly screen to preserve flat surface and covered with 64-mesh cloth. At edge seal strip, cloth is cemented to rubber gasket, and entire mat is bound around edge with bronze shoe to prevent blowouts and leaks.

STRIPPED PANEL is raised to upper position for next lift of concrete facing.

FIRST TWO STUDS of four used **(below)** are installed in form brackets to support upper panel until it can be filled with concrete and placed under vacuum.



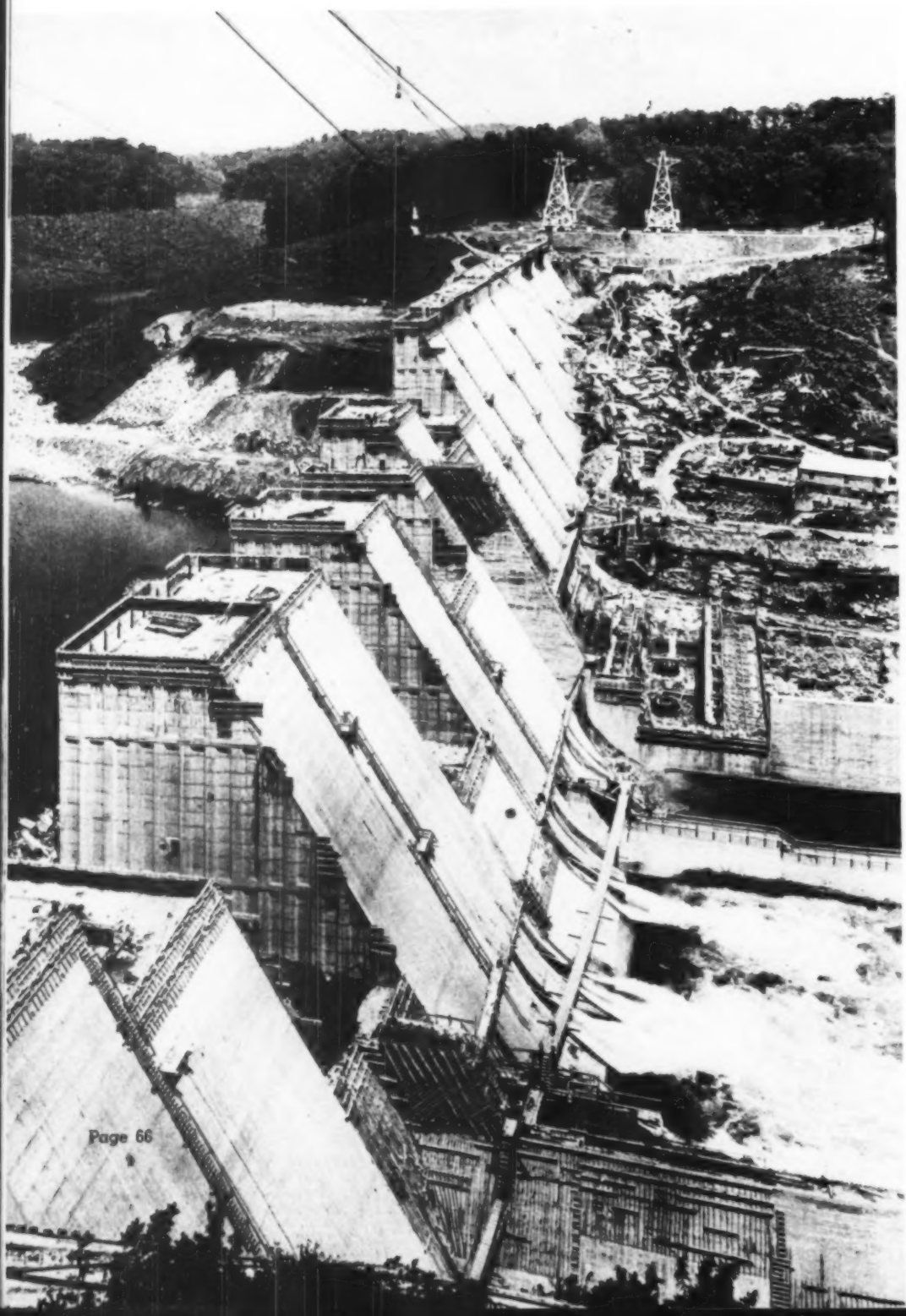
Wood Panel Forms

FOR BUILDING CONCRETE DAMS

Part V

Last of a Series of Articles Dealing with Form Design, Manufacture, Handling and Cost-Keeping Methods

By H. P. MAXTON
General Cost Engineer,
Tennessee Valley Authority, Knoxville, Tenn.



INITIAL COST OF PANELS which are to be given many uses is of little importance compared to the effect of the design upon multiple field handling. This fact does not imply that the initial cost should not be kept to a minimum.

Cost of manufacturing wood panel forms is materially affected by the amount of lumber (feet, b.m.) used for each square foot contact area of the forms. In general, the larger panel, with required heavier struts, studs and wales, costs more per square foot, but the lumber used, in terms of board feet, should be fairly constant for all sizes. The type and amount of hardware attached to the panels constitutes another cost under the control of the designer.

Mass production of panel forms should be considered a major construction chore if lowest cost is to be expected. The writer is familiar with one job which considered the construction of several hundred large panels as a "rainy day" job for the carpenter crew, with consequent high panel cost. Lower costs doubtless could have been obtained had the panel form builders at the shop been put on an uninterrupted production basis, with current studies and reports periodically checking progress and costs.

A reasonable breakdown of costs into components is as follows: (1) direct shop labor; (2) lumber, first cost (including warehouse and lumber yard handling charge); (3) hardware; and (4) carpenter shop overhead. A record of the number of each type and size built, contact area in square feet, and lumber used in board feet is essential in computing the average cost per panel, per square foot and per foot, b.m., of lumber.

Cost-Keeping Methods

It is common practice to include formwork as a component of the cost of concrete. To measure form cost, however, the square foot contact area has long been recognized as the proper unit of measurement. It is on the basis of square foot contact area, rather than as a component of the cost of concrete per cubic yard, that the cost engineer must seek to control expenditures for formwork.

Although panels take care of a large percentage of the total formwork on some projects, all types of forms must be considered and studied if cost control is to be completely successful. Three principal classes of formwork, therefore, will be covered in the following discussion of methods of keeping costs of placing and stripping forms.

THREE TYPES OF FORMS, panels, built-in-place and specials **(left)** are classes into which formwork normally is separated for intelligent cost control on concrete dams and locks.

TABLE I — Form Area Estimates

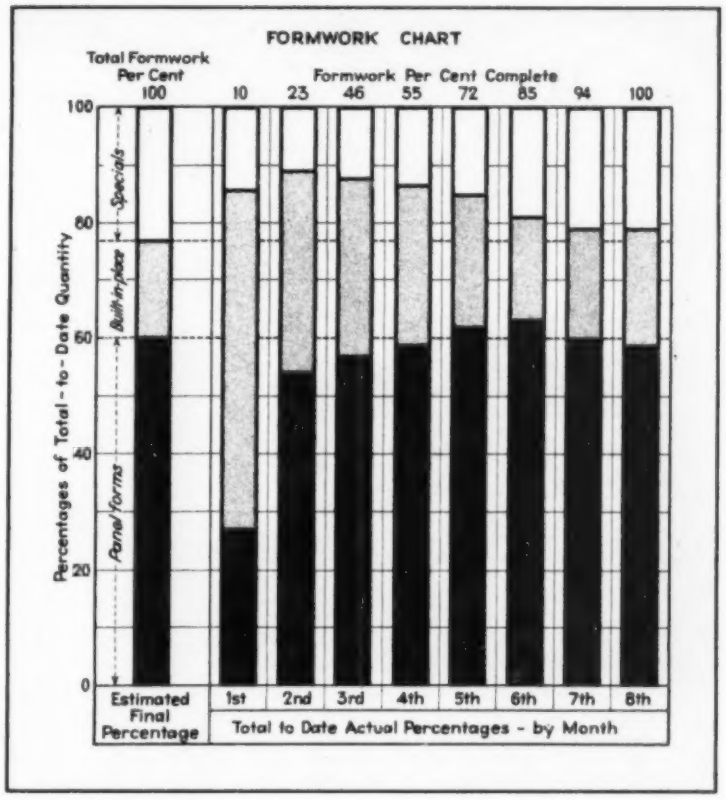
Estimated overall contact area per cubic yard		3.20 sq. ft.
Estimated panel area	=	60 per cent of total form area
Estimated built-in-place area	=	17 per cent of total form area
Estimated specials area	=	23 per cent of total form area

TABLE II — Job Engineer's Report — Month of June

Forms Erected	THIS MONTH	PREV. MONTH	TOTAL TO DATE
Panels	12,200 sq. ft.	0	12,200 sq. ft.
Built-in-place	25,800 sq. ft.	0	25,800 sq. ft.
Specials	6,500 sq. ft.	0	6,500 sq. ft.
Forms Now in Place			As of June 30th
Panels			7,000 sq. ft.
Built-in-place			13,600 sq. ft.
Specials			3,000 sq. ft.
Concrete Placed	10,000 cu.yd.	0	10,000 cu.yd.

Considerable study should be given to the problem of breaking down the formwork into the various types necessary for effective cost-keeping and analysis. In the first place, it may be assumed that the concrete already has been separated into classes, the bases for selection being determined by the natural division of one type of concrete from another. These classes of concrete, usually separated for bidding purposes, are a ready-made guide for determination of types of formwork to provide intelligent cost control.

Field cost control usually requires no more than three general types of forms. They are: (1) panel forms; (2) built-in-place (sometimes referred to as "field fabricated." These are "regular" surface forms.); and (3) specials. On large jobs, types (1) and (3) are usually constructed in the shop, where the first cost is easily obtained if a good cost-keeping system is in operation. Under the heading of "specials" comes such single or multiple-use forms as draft tube and scroll case forms, tunnel and gallery forms, drain forms, and soffit and haunch boards. After their first cost has been obtained in the shop, their erection and dismantling or wrecking costs can, if desirable, be separated in the field.


FORMWORK CHART
Total Formwork Per Cent
100
Formwork Per Cent Complete
10 23 46 55 72 85 94 100
Percentages of Total - to - Date Quantity
0 20 40 60 80 100
Specials
Built-in-place
Panel Forms
Estimated Final Percentage
1st 2nd 3rd 4th 5th 6th 7th 8th
Total to Date Actual Percentages - by Month

MONTHLY CHECK on actual percentages of use of various kinds of formwork is provided by formwork chart which compares running totals with estimated "bogey" set up at beginning of job.

(Continued on page 94)

TABLE III — Form Cost Report — Month of June

Erection Cost Data

	THIS MONTH	PREVIOUS MONTH	TOTAL TO DATE
Panels			
Quantity erected	12,200 sq.ft.	0	12,200 sq.ft.
Erection cost — total	$3,745.40	0	$3,745.40
Erection cost per sq.ft.	.307	0	.307
Built-in-Place Forms			
Quantity erected	25,800 sq.ft.	0	25,800 sq.ft.
Erection cost — total	$13,751.40	0	$13,751.40
Erection cost per sq.ft.	.533	0	.533
Special Forms			
Quantity erected	6,500 sq.ft.	0	6,500 sq.ft.
Erection cost — total	$4,407.00	0	$4,407.00
Erection cost per sq.ft.	.678	0	0 .678

Stripping Cost Data*

Panels			
Quantity stripped	5,200 sq.ft.	0	5,200 sq.ft.
Stripping cost — total	$431.60	0	$431.60
Stripping cost per sq.ft.	.083	0	.083
Built-in-Place Forms			
Quantity stripped	12,200 sq.ft.	0	12,200 sq.ft.
Stripping cost — total	$1,061.40	0	$1,061.40
Stripping cost per sq.ft.	.087	0	.087
Special Forms			
Quantity stripped	3,500 sq.ft.	0	3,500 sq.ft.
Stripping cost — total	$462.00	0	$462.00
Stripping cost per sq.ft.	.132	0	.132

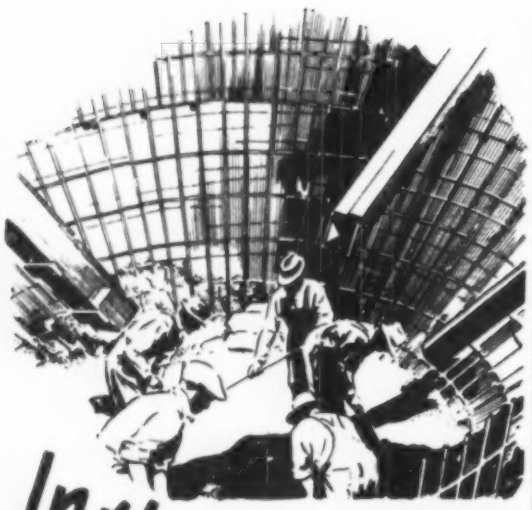
*Area stripped equals Forms Erected minus Forms Now in Place from Table II.

TABLE IV — Summary of Erection and Stripping Costs Per Square Foot

	COST PER SQUARE FOOT This Month	Prev. Month	Total to Date
Panels			
Erection cost	$.307	0	$.307
Stripping cost	.083	0	.083
Total cost	$.390	0	$.390
Built-in-Place Forms			
Erection cost	.533	0	.533
Stripping cost	.087	0	.087
Total cost	$.620	0	$.620
Special Forms			
Erection cost	.678	0	.678
Stripping cost	.132	0	.132
Total cost	$.810	0	$.810

TABLE V — Indicated Final Cost of Formwork Per Cubic Yard of Concrete Based On Actual Square Foot Costs and on Form Area Estimates Furnished by Job Engineer.

		THIS MONTH	PREV. MONTH	TOTAL TO DATE
Panels	(1.920 x .390)	$.749	0	$.749
Built-in-place	(.544 x .620)	.337	0	.337
Special	(.736 x .810)	.596	0	.596
Total cost per cubic yard		$1.682	0	$1.682



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Creates Easier, Quicker Placeability

In the rush of construction when the concrete is pouring, when days mean money and hurry is the word, — Pozzolith is in its glory.

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REMEMBER — POZZOLITH —

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2. For given placeability cuts mixing water up to 15%.
3. For given water-cement ratio increases slump 150%.
4. Increases compressive strength 15 to 20%.
5. Increases durability, under freezing and thawing, 100 to 200%.
6. Reduces bleeding, shrinkage, permeability.
7. Cuts absorption 20% — greatly improves water-tightness.

For almost a decade, throughout America, with greatly expanding use, Pozzolith has reduced costs of construction and created better concrete. The list of users includes big jobs everywhere.

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MASTER BUILDERS

CONSTRUCTION EQUIPMENT NEWS

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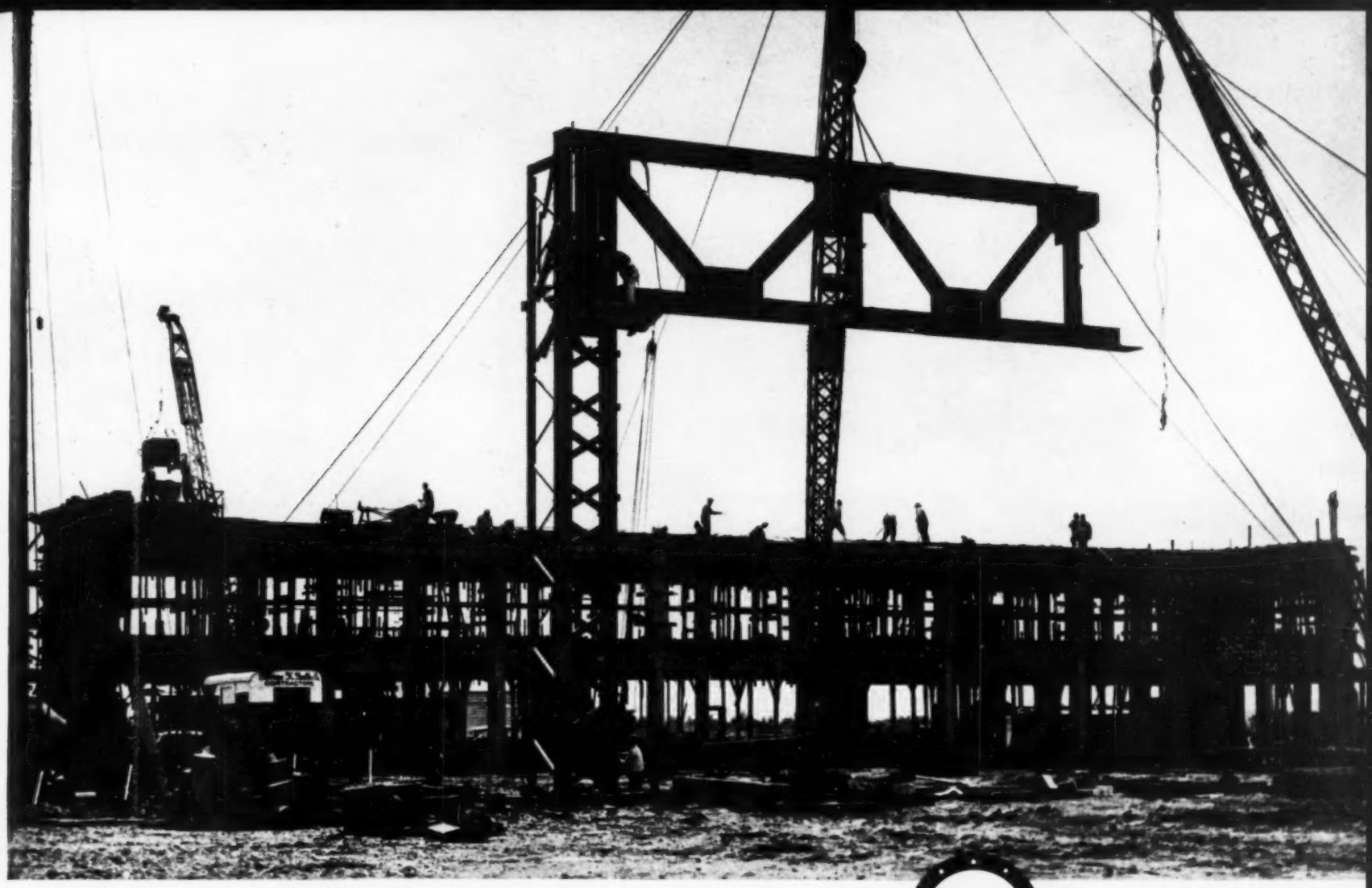
Review of Construction Machinery and Materials for OCTOBER, 1940

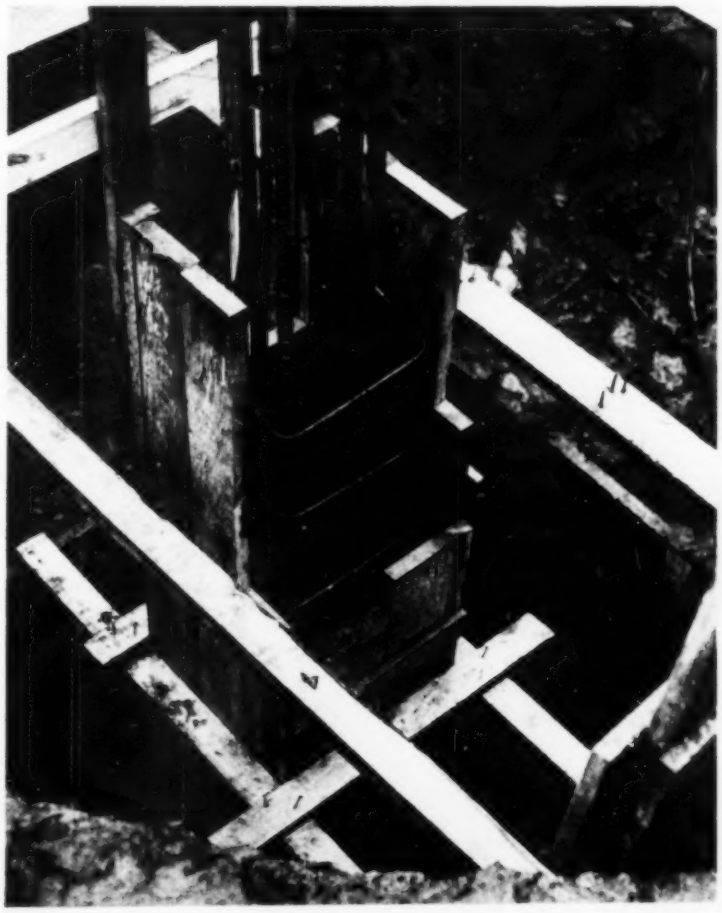
TWO NEW MOTOR GRADERS, "engine over drive" type, have as chief characteristics wide range of blade adjustments in all directions, tandem drive with low pressure tires and leaning front wheels which can make them available for all kinds of surface, ditch and bank work. Larger heavy-duty model is powered by 62½-hp. diesel engine; smaller by 45-hp. gasoline engine. Machines built around all-welded, box-type main frame said to be noted for strength and rigidity, and to permit operator full unobstructed view of work. Advantages claimed by manufacturers: (1) Blade can be adjusted from deep ditching to high bank-cutting positions in about 40 sec., permitting most adjustments to be made by operator without leaving cab; (2) circle is full revolving permitting blade to be set to ditch or to move material with machine operating in reverse gear; blade also can be reversed with scarifier on machine by lifting scarifier teeth out; (3) balanced weight distribution permits surface maintenance at 6 to 7 m.p.h. without objectionable bouncing or vibration. Both machines have eight forward and two reverse speeds, with high top speeds for traveling.—**J. D. Adams Co., Indianapolis, Ind.**

★ ★ ★

LIGHTWEIGHT HORIZONTAL BORING TOOL designed for one-man operation in installing underground pipe, drills bores to accommodate pipe up to 4½ in. in diameter and 50 to 60 ft. long. Because of low air consumption, tool is said to require use of small compressor only and thereby to obviate necessity of moving large crews, heavy equipment and compressors to small jobs. Joined 2-ft. sections of boring bars are driven by powerful high-speed air motor. Small high-pressure stream of water circulating through hollow drill stems keeps cutting edges of boring bit cool and well lubricated. Water also acts to keep hole well "mudded," preventing sloughing of walls and in addition, sluicing cuttings from hole. Advantages: elimination of pavement cutting, open ditching, traffic hazards and lawn destruction; reduction of necessary soil removal and pipe installation cost. Most effective use in drilling under streets, highways, railroad tracks, gardens, lawns, inlaid sidewalks and embankments.—**Hydrauger Corp., 116 New Montgomery St., San Francisco, Calif.**



FIRST SECTION OF MAIN TRUSS along front of hangar is raised into position by guy derrick, as workers pour concrete for office building, in background. Fabricated in three sections, main truss spans 164 ft. 6 in., center to center of columns, and is 32 ft. 6 in. deep.



STUB COLUMNS or piers of reinforced concrete are carried up to surface from tops of Douglas fir piles which are cut off at ground-water level 10 ft. below general elevation of site.

NEW HANGAR FOR UNITED AIR LINES HAS

164½-Ft. Steel Truss

UNITED AIR LINES new $200,000 hangar and office building at Columbia Airport, Portland, Ore., designed by Albert Kahn, Inc., architects and engineers, of Detroit, Mich., provides a structure large enough to accommodate three of the company's 12-ton Douglas DC-3 mainliner planes and the new 25-ton Douglas DC-4 super-mainliners, now under construction; these planes have wing spreads, respectively, of 95 and 117½ ft.

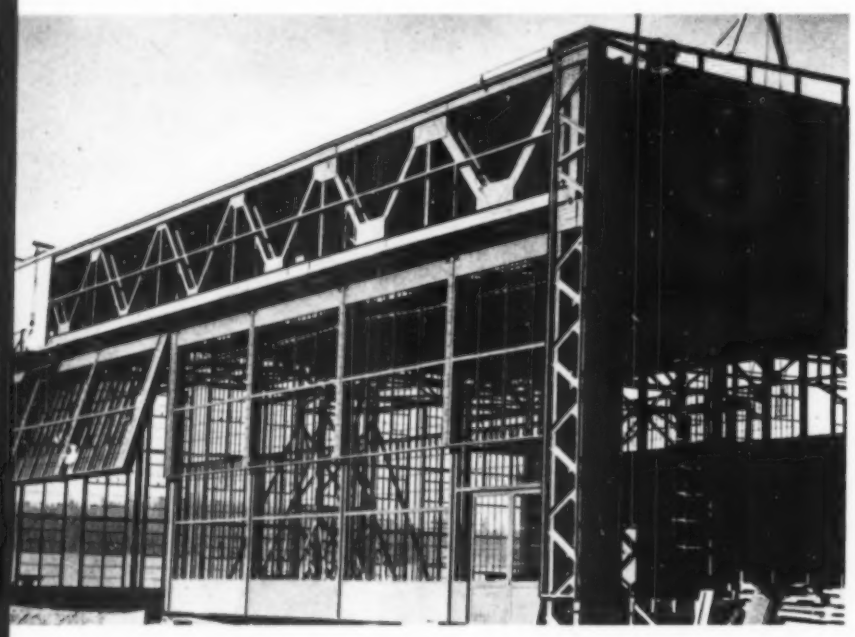
The hangar, a steel structure with wood roof decking and 7-in. thick concrete floor, is 169 ft. 5 in. x 105 ft. 9 in. in plan, while the office section, built two stories high along one side of the hangar, is of reinforced concrete design, 168 ft. long and 24 ft. 5 in. wide. The hangar is equipped with electrically-operated doors of the canopy type, providing a clear opening of 160x30 ft. The office structure provides space for the company's station offices, the U. S. Weather Bureau, the Civil Aeronautics Bureau district offices and a large passenger

ROOF CONSTRUCTION of hangar, showing transverse trusses framed into main truss and manner in which they are carried on concrete columns of office portion of building.

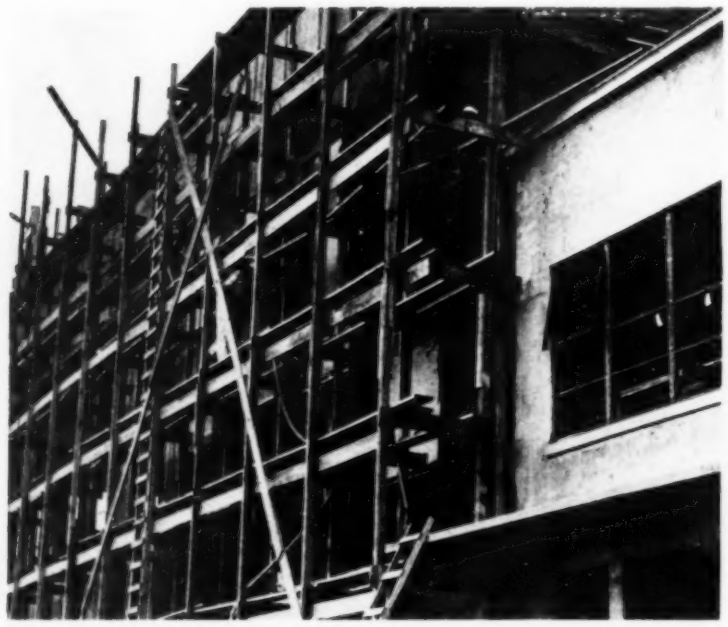
lobby and waiting room, adequate to take care of all requirements.

The character of soil at the site, which is along the Columbia River, required the driving of 76-ft. Douglas fir piles to support the hangar and office structures. This work was done by the general contractor, George H. Buckler Co., of Portland, Ore., using a No. 1 Vulcan single-acting hammer in 94-ft. leads. The piles were cut off at ground-water level 10 ft. below the surface of the site to insure preservation of the timber by contact with water throughout the length of the pile. At the −10-ft. elevation the wood piles were capped with concrete in which dowels were inserted for anchoring stub columns or piers of reinforced concrete, extending up to ground level to support the building superstructure.

Erection of steel for the hangar was

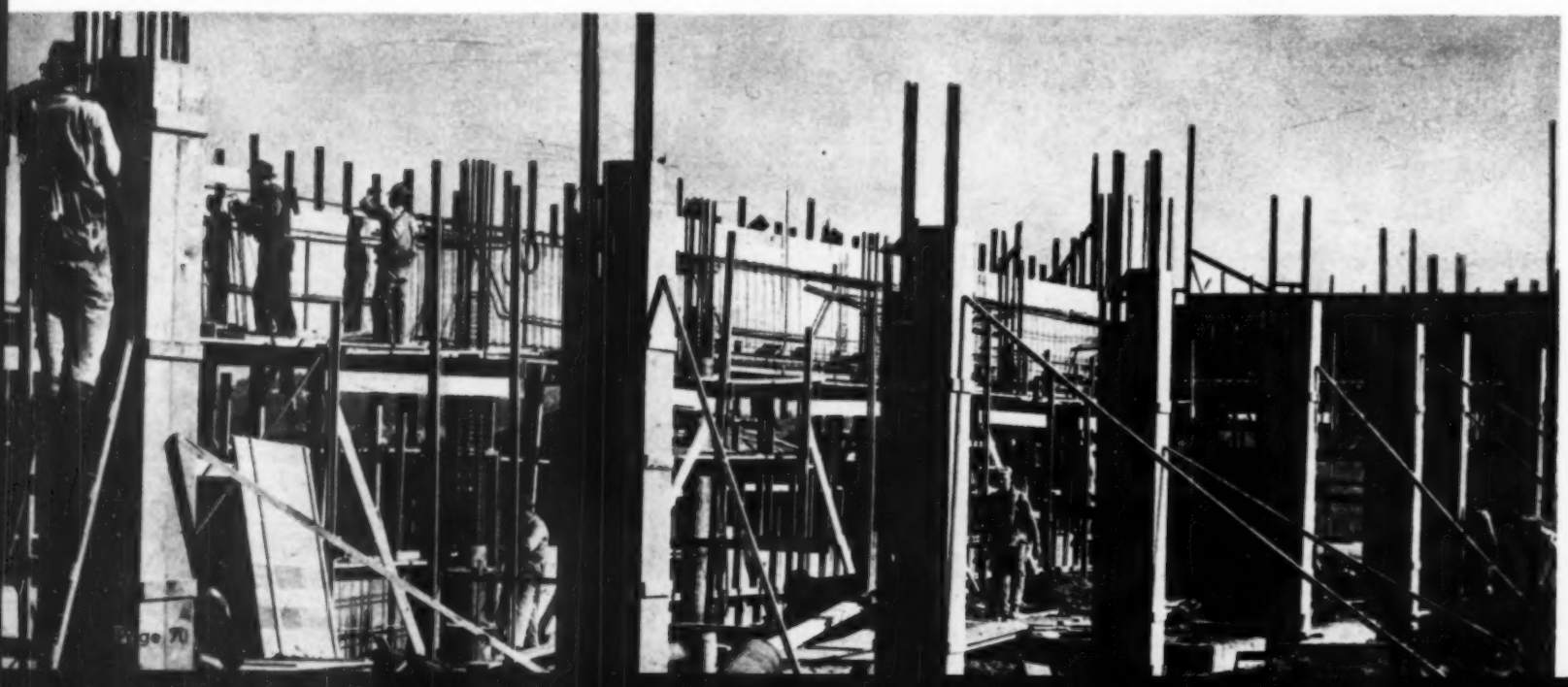


STEEL FRAME OF HANGAR completed, showing main truss of 164-ft. 6-in. span along front end being sheathed (at left) with asbestos-protected metal. Front of building is inclosed by two telescoping doors, each 80 ft. long and 32 ft. 6 in. high, opened and closed by motor drive.



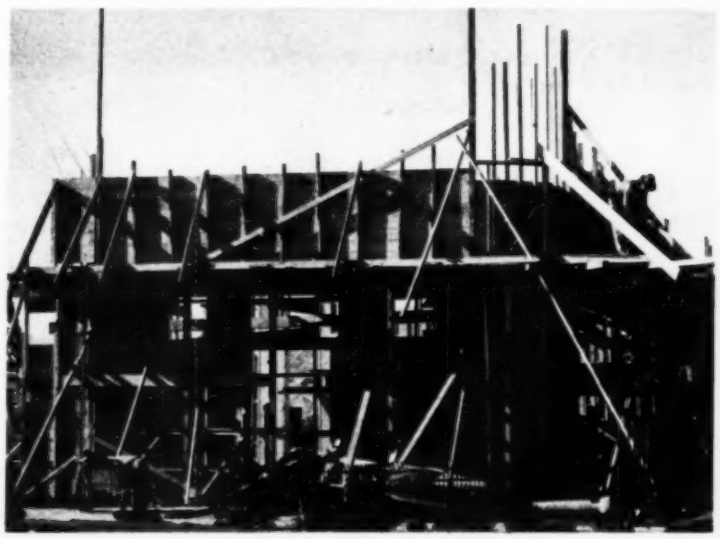
FROM WOOD SCAFFOLD walls of hangar are inclosed by applying 2½-in. thickness of Gunite on reinforcing mesh.

COLUMN FORMS and reinforcement **(below)** are in place for first-story construction of concrete office building along rear of hangar.

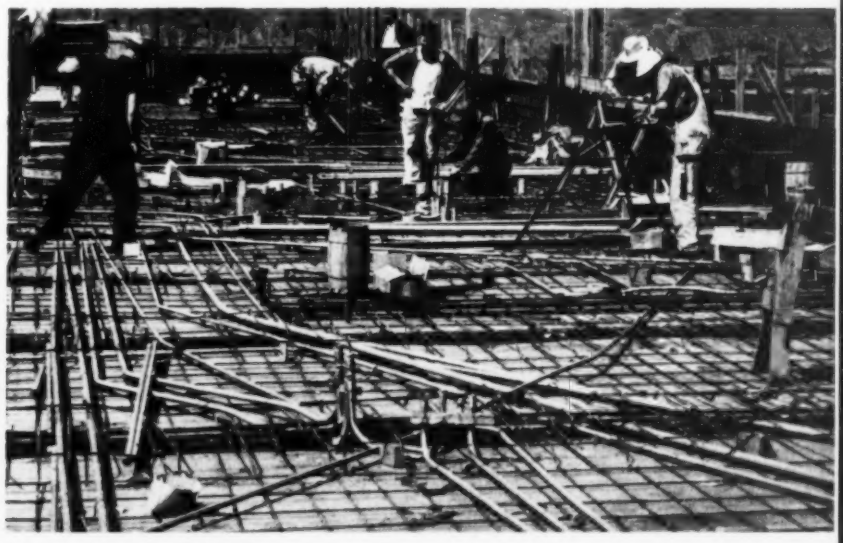


done by the Bethlehem Steel Co., using guy derricks and mobile cranes. Fabricated in three sections, the big main truss along the front of the hangar spans a distance of 164 ft. 6 in., center to center of columns, and is 32 ft. 6 in. deep. Into it are framed seven transverse trusses spanning 103 ft. 5 in. to the interior column row of the office building along the rear end of the hangar. The design provides a hangar floor area 103x168 ft., unobstructed by columns. Hung from the main truss of the hangar two doors, each 80x32½ ft. in size, inclose the west elevation of the structure. In opening, the lower half of each door telescopes into the upper half, giving a vertical clearance of 30 ft. Sidewalls are of Gunite, 2½ in. thick shot upon wire mesh reinforcement hung upon a light steel framework. Steel sash is used throughout.

ACCOMMODATIONS for three of these 12-ton Douglas mainliners is provided in United Air Lines new hangar at Portland, Ore.



FOR OFFICE BUILDING wood forms have been set to receive concrete for exterior walls of first story. Shoring is in place to support canopy slab which is cantilevered from wall.



ELECTRIC CONDUIT LINES and steel reinforcement are set for second-floor slab preparatory to pouring of concrete for office building. Beams spaced 10 ft. apart have spans of 24 ft. between walls.

ROOF DECK of office building **(below)** has wood forms and reinforcement in place to receive concrete delivered by rubber-tired buggies.

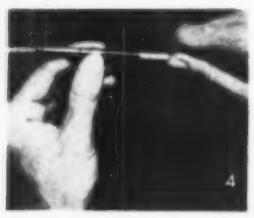
THE SQUARE KNOT IS *right* FOR MAIN LINE CONNECTIONS

For the main surface lines connecting holes and rows of holes, use Plain Primacord. It is light in weight, flexible, waterproof, and sufficiently resistant to abrasion — ideal for this service.

The continuous main line can be made up of separate lengths, each connection being a *square* knot, as shown. This type of connection should be used above ground only — *never in a bore hole.* In fact, it is advisable to see that the Primacord used in a bore hole is one continuous length, without joints of any kind.

Primacord-Bickford Detonating Fuse, used correctly, increases blasting efficiency and decreases cost and hazard. Write for bulletins.

PB-25

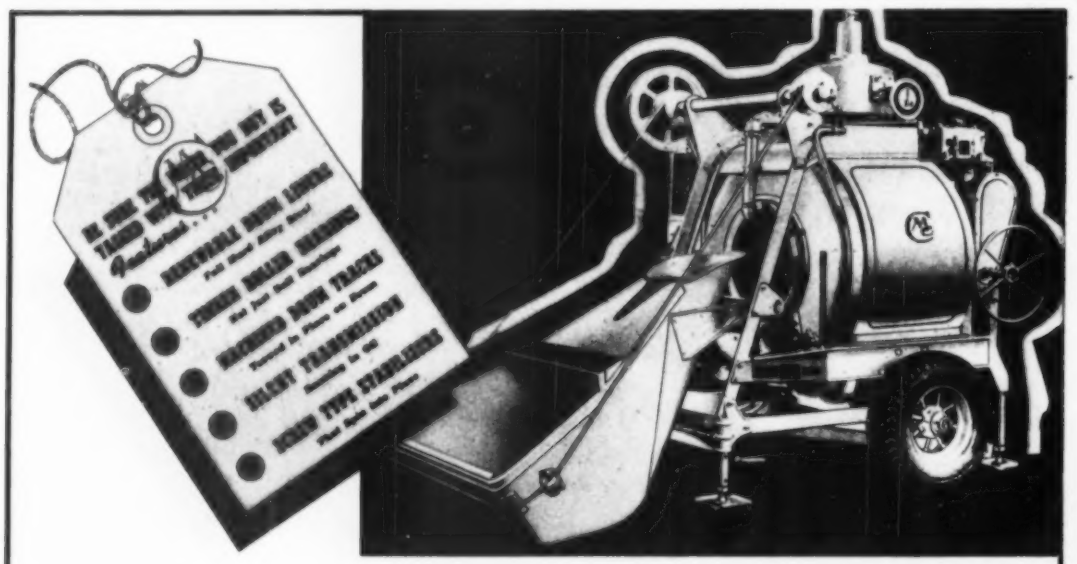


THE ENSIGN-BICKFORD CO., Simsbury, Conn.
Makers of Cordeau-Bickford Detonating Fuse — and Safety Fuse since 1836.

PRIMACORD-BICKFORD *Detonating* FUSE

1. Tie through cartridge.
2. Half hitch branch to main line.
3. Connect main line lengths with *square* knot.
4. Fuse and cap on end of main line.

Important: Branch lines should lead away from main lines at *right* angles. Avoid kinks and small loops.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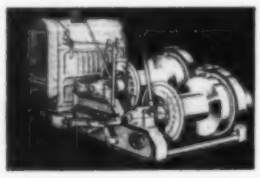

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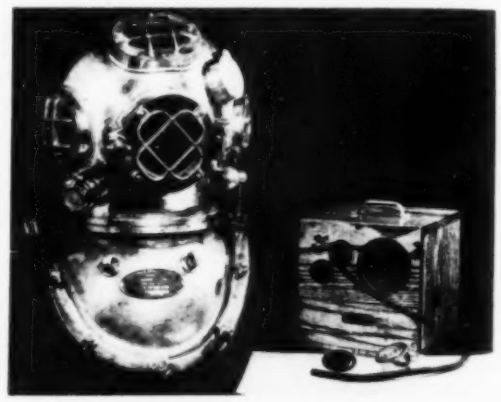
CONSTRUCTION MACHINERY CO., Waterloo, Iowa

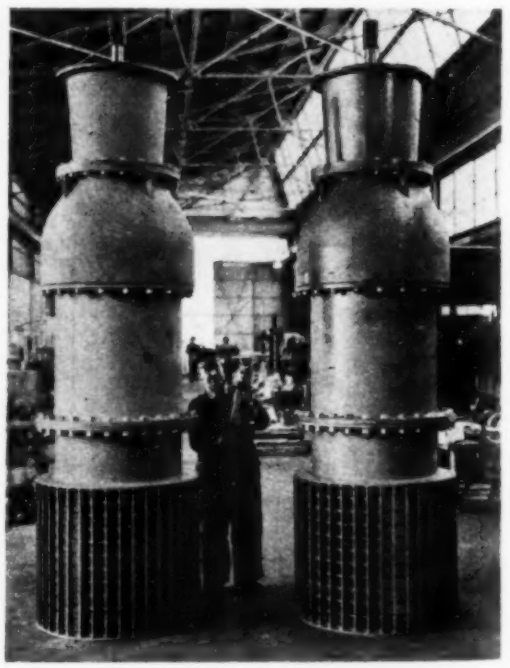
CONSTRUCTION EQUIPMENT NEWS . . . *Continued*



LOUDSPEAKER PHONE FOR DIVER eliminates necessity for ear phones, tubes or other delicate parts. Two watch-case units (at right), consisting of sealed microphone and dynamic receiver, are attached inside helmet, without any connection to body of diver. Above water 8x8x8-in. oak cabinet, equipped with microphone, receiver with loudspeaker, amplifying circuits, shutoff switch and two 1½-v. dry-cell batteries, is connected to units in helmet by rubber-covered cable. This Superphone equipment permits two-way conversation between diver and tender on shore. Can be installed in diving equipment now in use in 2½ hr. — **Craftsweld Equipment Corp., 2727 Jackson Ave., Long Island City, New York, N. Y.**

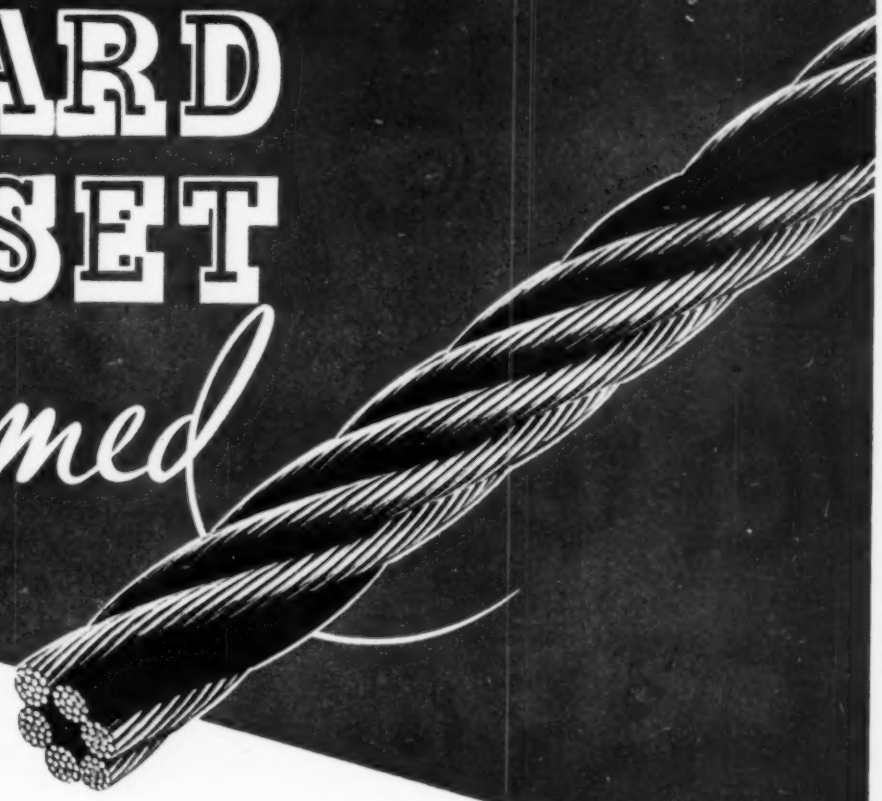
★ ★ ★

TWO 15,000-G.P.M. VERTICAL TURBINE PUMPS for unwatering caissons, sumps and concrete basins and for emergency service in Panama Canal Zone, weigh 60,000 lb. each, exclusive of motors and are powered by 250-hp., 25-cycle motors. Pump shafts operate at 720 r.p.m. Bowls are 36-in. diameter; column pipe, 24-in. diameter. To enable pumps to



handle salt water, corrosion resistant columns made of fabricated USS Cor-tan steel, and stainless steel shafting are used. Special bronze impellers with vanes incorporating new principle of hydrodynamic flow lines increase efficiency. Each impeller blade is curved with tear-drop edges, not unlike airplane propeller, to avoid water eddies and to insure even flow of water upward. Extra heavy strainer of grid design and made of welded steel bars is provided to withstand entire weight. At times these pumps will operate continuously for weeks handling more than 300,000,000 gal. of water weekly. —**Peerless Pump Division, Food Machinery Co., 301 West Ave., 26, Los Angeles, Calif.**

HAZARD LAY·SET *Preformed*



IS SAFER
LASTS LONGER
HANDLES EASIER
RESISTS KINKING
SPOOLS BETTER
RESISTS ROTATING
GIVES GREATER
DOLLAR VALUE

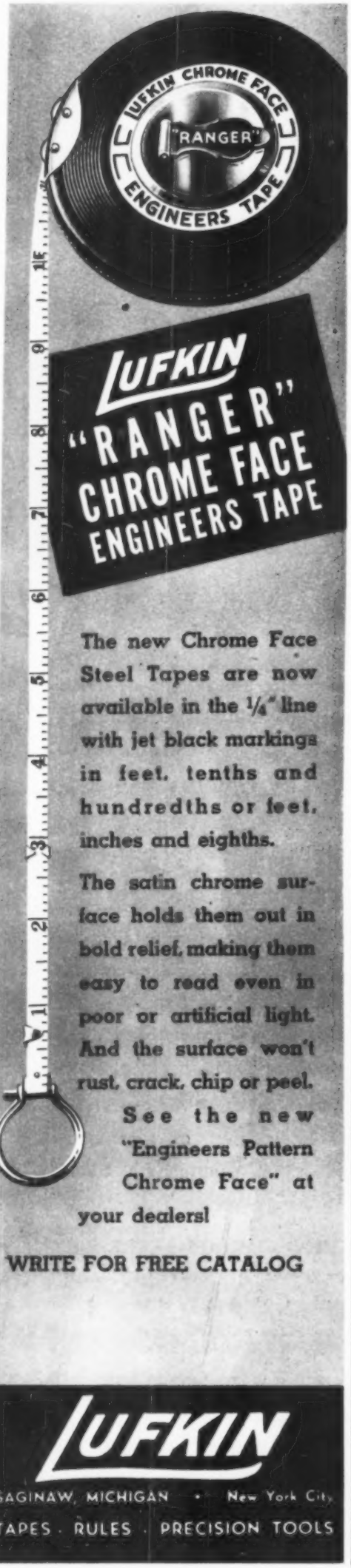
GREEN SIGNIFIES SAFETY

● The seven points at the left make a big statement, but every word is *true*. In fact, there are other important merits about Hazard LAY-SET Preformed that we haven't space to mention here.

Hazard LAY-SET is put through a scientifically calculated preforming process at the mill. This process eliminates the internal strain present in non-preformed rope. This relief from stresses makes LAY-SET a rope that is relaxed and willing to work. Every wire has amazing resistance to bending fatigue (and therefore lasts longer). Being flexible and limber, LAY-SET is easy to handle. Broken crown wires do not wicker out to jab workmen's hands. These are some of the other qualities which make Hazard LAY-SET Preformed the wire rope of greater dollar value, as operators now using LAY-SET Preformed will tell you.

HAZARD WIRE ROPE DIVISION • WILKES-BARRE, PA.
Established 1846
American Chain & Cable Company, Inc.
District Offices: New York, Chicago, Philadelphia, Pittsburgh, Fort Worth, San Francisco, Denver, Los Angeles, Atlanta, Tacoma

LAY·SET *Preformed* WIRE ROPE


LUFKIN CHROME FACE
"RANGER"
ENGINEERS TAPE
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"RANGER"
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ENGINEERS TAPE
The new Chrome Face Steel Tapes are now available in the 1/4" line with jet black markings in feet, tenths and hundredths or feet, inches and eighths.
The satin chrome surface holds them out in bold relief, making them easy to read even in poor or artificial light. And the surface won't rust, crack, chip or peel.
See the new "Engineers Pattern Chrome Face" at your dealers!
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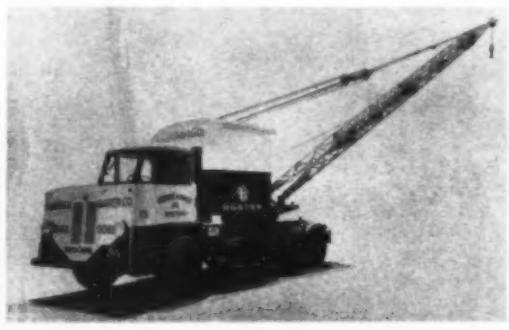
LUFKIN
SAGINAW, MICHIGAN • New York City
TAPES · RULES · PRECISION TOOLS

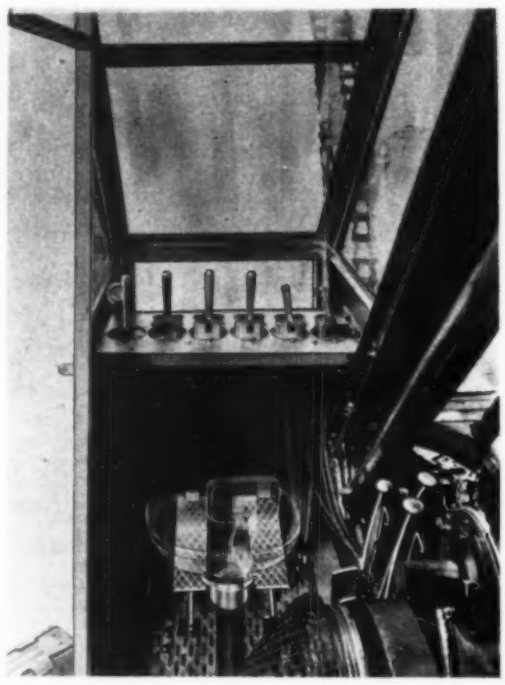
FULL-REVOLVING CRANE, called "Moto-Crane", convertible to shovel, dragline, clamshell or backdigger use, is recommended for high speed mobility in getting from job to job and for serving a variety of widely scattered operations of long or short duration. Moto-Crane turntable is mounted on crane carrier which has following features: (1) 3-axle mounting supported on 10 rubber tires, both tandem and rear axles driving; (2) mounting built of standard parts; (3) wheelbase 175 in. for better maneuvering—special steering gear for soft ground travel; (4) chassis frame design eliminates reinforcing; (5) ten speeds forward (high, 28-31 m.p.h.) and two reverse; (6) offset cab to permit carrying boom in low traveling position over front end;



(7) rocker arm rear end instead of springs; (8) space for groundman, tackle and rigging. Mounted on crane carrier is improved turntable built to balanced center drive design, employing patented sloping machinery frame. Power is delivered from motor to center drive pinion by means of roller chain power takeoff. Center drive pinion in turn powers hoist and swing shafts, permitting full engine power to concentrate on either operation or between related and synchronized simultaneous operations. Boom hoist on turntable is interlocked with rotation of hoist shaft so that boom lowering is achieved under power control and limited by hoist shaft rotation. Built in five models ranging from units in which minimum total weight is main objective up to heavy-duty units that carry booms 100 ft., or longer.—**Thew Shovel Co., Lorain, Ohio.**

★ ★ ★

VACUUM-CONTROLLED SHOVELS, ½-, ⅝-, and ¾-yd. capacities, feature single lever for controlling both hoist and dipper trip making it unnecessary for operator to reach for second lever to dump dipper load. Swing, crowd, travel and boom hoist



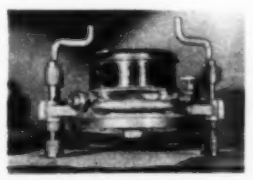
operations are vacuum controlled by six toggle levers, thus reducing operator fatigue. In addition to speed provided by eliminating lost motion of shifting long levers Mevac vacuum control system is said to eliminate condensation, moisture and freezing trouble and not to be affected by temperature or climatic conditions. Also this feature allows operator to retain "feel" of work on dig-and-hoist actions. — **Buckeye Traction Ditcher Co., Findlay, Ohio.**

What's *your* tension problem? Expansion . . . contraction . . . strong steady pulls . . . sudden impacts?

Whatever it is, the Martin-Decker Tension Indicator can help you solve it. This instrument measures — *in pounds* — the exact load *as it falls on the line.* No guessing, no paper calculations and no dead-ending. You simply clamp it on the line and read the dial!

The Martin-Decker Tension Indicator gives you, quickly and accurately, the real lowdown on cable loads. It increases wire line performance, safety, and efficiency in the field.

Three sizes: Miniature, Standard and Heavy Duty for all lines up to 2¼" diameter, adjustable for temperature changes. Write for complete dope, and ask about the Martin-Decker Measuring Line Weight Indicator.



MARTIN DECKER CORP.
HOME OF THE WEIGHT INDICATOR
LONG BEACH CALIFORNIA

● THE *NEW* WAY TO DRILL HOLES IN CONCRETE, TILE, etc.

50-75% FASTER!

Amazing new drill-point contains special metal harder than hardest steel. Goes through concrete, tile, slate, porcelain, etc., 50 to 75% faster. Drills cleaner, more accurate holes. Speeds up installation of expansion anchors. Saves your skilled time for more profitable work. Eliminates noisy hammering, monotonous chiseling. Doesn't splinter fragile work. No special equipment needed—use in any rotary drill. Get *your* share of those extra profits now possible. Send coupon for leaflet.

CARBOLOY COMPANY, INC.
DETROIT, MICHIGAN

Carboloy Co., Inc.
11125 E. 8 Mile Ave., Detroit
Send free leaflet on Carboloy Masonry Drill-Points, for drilling concrete 75% faster.

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CARBOLOY
MASONRY DRILL-POINTS

41% Repeat Orders

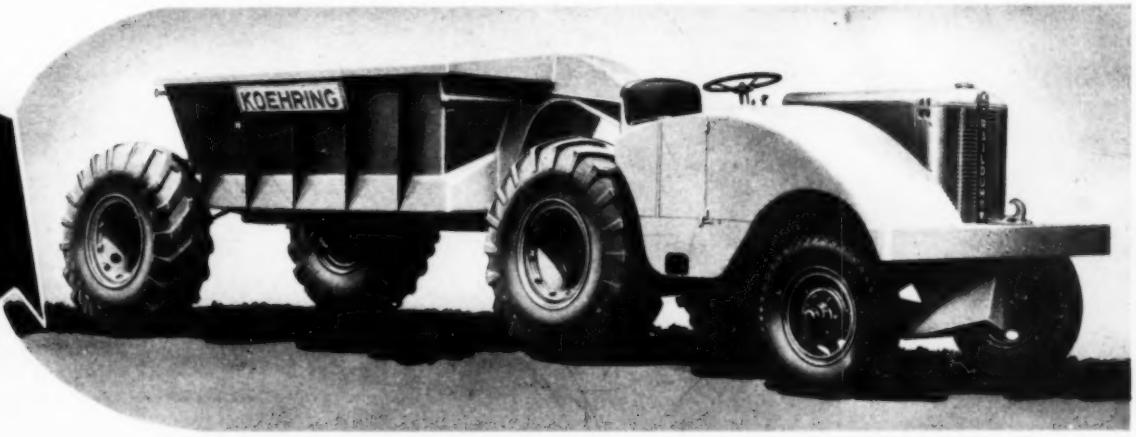
for KOEHRING Dirt and Rock Hauling EQUIPMENT

DUMPTOR

Low Cost Per Yard . . . **that's the story behind the contractor's acceptance of Koehring Hauling Equipment. Convincing proof of this is the repeat business from satisfied users. 41% . . . for the Koehring Dumptor . . . Trail-Dump . . . Wheeler. Reasons for low cost per yard are . . . high speed travel . . . easy and fast loading . . . quick and clean dumping . . . pneumatic tire flotation for speed . . . high horsepower per gross ton load. Ask the owners why their costs are lower. Get this "Low Cost Per Yard" story today, from your nearest distributor, or write us for information.**

KOEHRING COMPANY • Milwaukee, Wisconsin

TRAIL-DUMP



WHEELER

KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

JAEGER "HIGH DUMP" TRUCK MIXERS

Solve Your Placing Problems

INTO HOPPERS OR BIG BUCKETS

OVER DIRT PILES INTO THE FORMS

FASTEST LOADING, FASTEST MIXING AND FASTEST HIGH DISCHARGING TRUCK MIXER ON THE MARKET . . .

NEW DRUM SIZES BOOST PAYLOAD

Latest development by world's largest mixer manufacturer — mobile 2, 3 and 4 yd. concrete plants that cut placing costs, deliver proven higher strength concrete. One-Shot Top Loading, 2-Speed Mixing, Vacuum Controlled Discharge, many other features. GET CATALOG, PRICES, EASY TERMS.

HIGH DUMP MIXERS

2, 3, 4 Cu. Yd. Sizes. 2 Yd. Size Mounts on Short Wheelbase Ford-Type Trucks

Also STANDARD HEAVY DUTY MIXERS

up to 5½ Cu. Yds. (7½ Cu. Yd. Agitators)

THE JAEGER MACHINE CO., 800 Dublin Ave., Columbus, Ohio

Ready-Mix Concrete in Less Than One Week

That's speed! And speed is the keynote to profit. Contractors must have equipment that is *dependable*. In the wellpoint business that means MORETRENCH.

Dry results are guaranteed on every job.

MORETRENCH CORPORATION

90 WEST STREET, NEW YORK

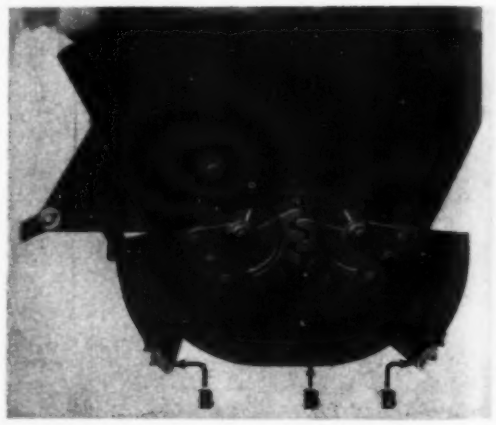
Plant: Rockaway, N. J. Warehouses: Joliet, Ill.; New Orleans, La.

TREE MOVING CRANE UNIT for use particularly on 1½-ton truck chassis, consists of all-steel platform body, winch with niggerhead, detachable crane equipped with wire rope, universal sheave block, complete rack sides, two speed forward and reverse power takeoff, all controls and adjustable jacks and tool boxes. May be erected or removed in 10 min. Winch is used to pull crane on to truck. When crane is in place, tree balls up to 6 ft. in diameter and 3 tons in weight are quickly picked up, transported and reset. Co-inventors, Paul H. & James A. Davey of Davey Tree Expert Co., Kent, Ohio. Rights to manufacture and sell unit belong to **Gar Wood Industries, Inc., Detroit, Mich.**

★ ★ ★

GENERAL DUTY CONCRETE BUCKETS, ¾- to 3-cu.yd. capacities, are designed for distributing mass concrete, for filling narrow forms and for other spreading operations either with normal or low slump concrete. To prevent leaking of concrete, neophrene (duPont product) seals used along lips of gates and bottom edge of hopper of bucket, are said

GATES OF CONCRETE BUCKET (A) open to permit placing of concrete.

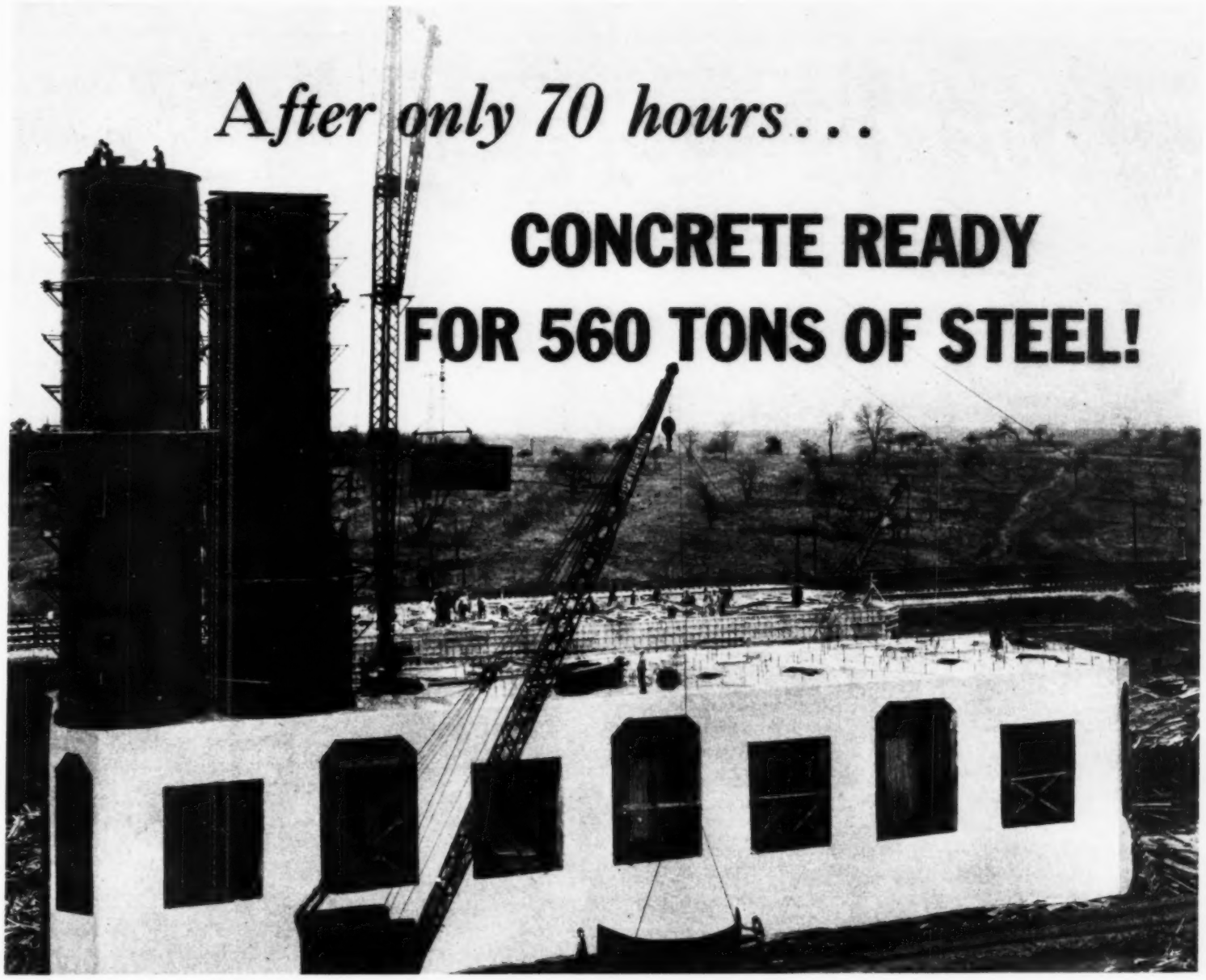


NEOPHRENE SEALS (B) hold against pressure of concrete and resist effects of oil used in bucket.

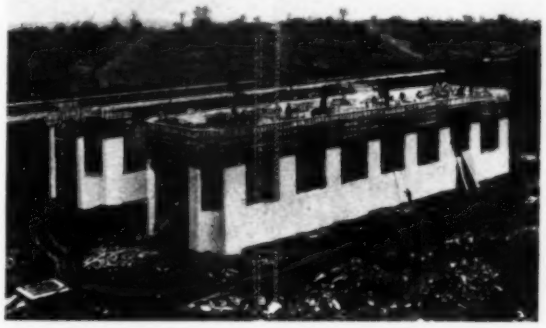
to withstand successfully abrasive action of opening and closing gates, pressure and discharge action of concrete and effects of oil used to facilitate flow of material from bucket. Other features: (1) Heavy reinforced bail; (2) heavy steel channel buffer; (3) control handle; (4) controlled center-line discharge; (5) self-locking gate toggle; (6) heavy steel plate gear guard; (7) rubber gasketed-geared control double arc clamshell gates; (8) roller bearing trunnions; (9) heavy steel channel base ring. — **The Heltzel Steel Form & Iron Co., Warren, Ohio.**

After only 70 hours...

CONCRETE READY FOR 560 TONS OF STEEL!



● Foundation for new sintering plant, Wenonah Mines, Alabama. Two of the sixteen steel silos are shown in place on the concrete top deck. Only 70 hours after this Atlas High-Early concrete deck was placed, it was strong enough to support the heavy stiff leg derrick and to allow erection of the 560 tons of steel silos to begin.



● Slab of top deck being placed with Atlas High-Early concrete. Engineer: A. W. Beck, Tennessee Coal, Iron and R. R. Co. Contractors: Rust Engineering Co., Pittsburgh, Pa.

Atlas High-Early cement helps cut time and costs for concrete foundations of new sintering plant!

A SUDDEN cold snap...and work on the Tennessee Coal, Iron and R. R. Company's new sintering plant shifted into low gear. To speed up construction was imperative—so they switched to Atlas High-Early cement for a concrete that gains working strength rapidly.

70 hours—less than three days—after the Atlas High-Early concrete top deck slab had been placed, it was strong enough to support the stiff leg derrick and to allow the 560 tons of steel construction to begin! This, in spite of temperatures below 50 degrees!

Moreover, by the time it would have taken normal portland cement to gain sufficient strength to permit erection to begin, the sixteen steel silos, weighing 560 tons, were already in place on the Atlas High-Early concrete deck slab.

That's making time—and money, too. Atlas High-Early cement often pays back its slightly higher cost over and over again by saving days and weeks of costly building time—especially under abnormal weather conditions. Use this cement on your next job. Universal Atlas Cement Co. (United States Steel Corporation Subsidiary), Chrysler Building, N. Y. C.

Offices: *New York, Chicago, Phila., Boston, Albany, Pittsburgh, Cleveland, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.*

CM-H-20

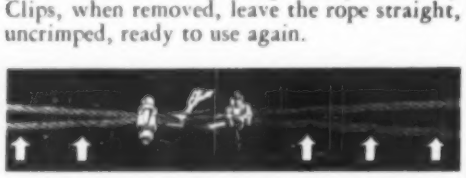
ATLAS HIGH-EARLY CEMENT

A UNIVERSAL ATLAS PRODUCT

NO CRIMPING "FINGER PINCH" THAT SPOILS WIRE ROPE

When a Laughlin drop forged Safety Clip takes hold of wire rope, it means business. The solid fist-like grip is 50% more efficient than ordinary U-Bolt Clips, as proved by recent tests at a famous engineering school.

You also save the rope that would ordinarily be cut off after being crimped by the "finger pinch" action of U-Bolt Clips. Laughlin Safety Clips, when removed, leave the rope straight, uncrimped, ready to use again.



FEWER CLIPS NEEDED. Where you've been using four ordinary U-Bolt Clips, you will need only three Laughlin Safety Clips to get the same strength.

FASTER TO APPLY. Laughlin Safety Clips have nuts on opposite sides — easy to get at — you can use two wrenches at once. That saves time — and many a cuss-word.

Write for the free booklet giving results of tests made by a famous engineering school. Take the first step to saving some real money by mailing the coupon now.

THE THOMAS LAUGHLIN CO.
Portland, Maine

Please send me free Safety Clip booklet B-9

Name.....

Company.....

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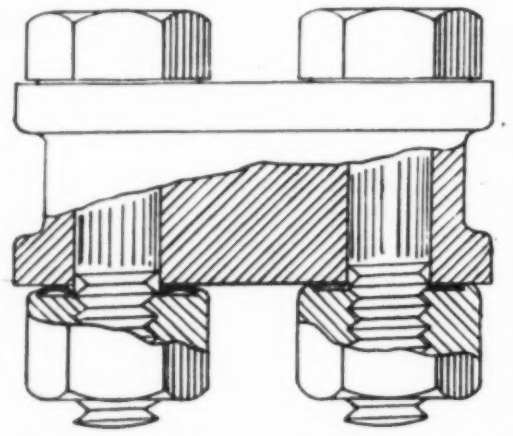
Check here for catalog on items below ☐

Look for Laughlin products in Thomas' Register and buy through your distributor.

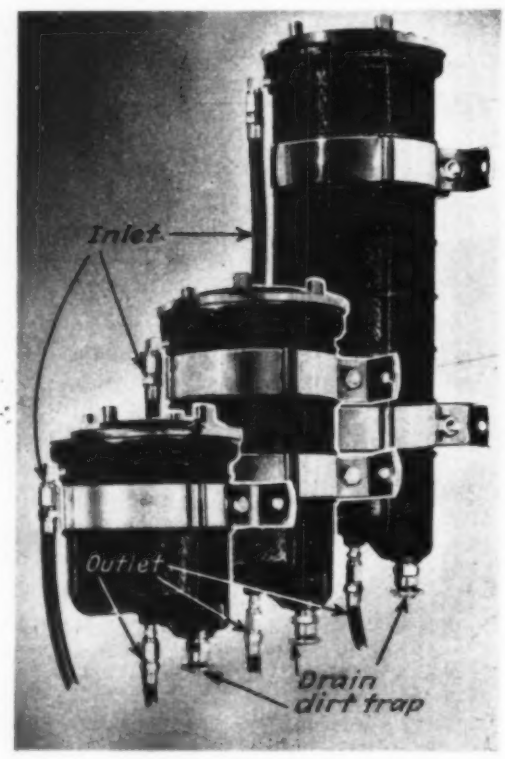
ONE-PIECE, ALL-METAL LOCK NUT called An-cor-lox, utilizes new locking principle said to permit effective, positive locking of nut to bolt and not to work. Nut is spun on bolt and drawn up to desired degree of tightness whereupon it locks itself automatically to bolt by means of arcuate-shaped metal ring which expands by pressure into root of bolt thread and against nut rim. This lock joint said to



hold securely under all heat conditions and vibration. No special length of bolt required. Lock nut does not damage bolt thread or mar surface of work, permitting same nut to be used again and again. Of especial convenience in fitting and adjustment of bearings and other parts. For primary set-up, accurate fit is obtained merely by spinning nut in reverse position. In final set-up nut is turned to normal position for automatic locking. Available in all standard sizes and in all metals.—**An-cor-lox Division, Laminated Shim Co., Inc., 64 Union St., Glenbrook, Conn.**

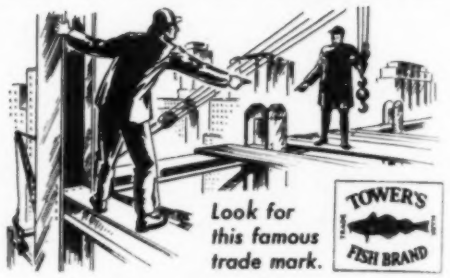
★ ★ ★

SELF-FLUSHING OIL CLEANERS, designed to keep oil pure under harmful dust conditions, are being manufactured in six models—for trucks, tractors, industrial combustion engines and passenger cars. When motor is stopped "Car-Life" cartridge expands and sheds off dirt and carbon into dirt trap which is flushed by opening valve while



motor is running, sludge being forced out under pressure. Effective life of cartridge said to be doubled by self-flushing feature. Cleaners claimed to operate efficiently up to 15,000 mi. under adverse and up to 25,000 mi. under normal conditions. Acids and varnish in oil are neutralized and absorbed by "Power Tone" with which cartridge is impregnated. In addition, dirt, carbon and sludge particles are trapped and may be flushed at frequent intervals, assuring only full-bodied oil for circulation through engine.—**T. D. Briggs, Oil Purifier, Inc., 3450 Broadway, Oakland, Calif.**

MEN- *get complete all weather protection with* **TOWER'S RUBBERIZED**
(A LATEX PRODUCT)
SUITS, COATS and HATS



Tower's waterproof, rubberized work clothing gives dependable, durable performance. Medium weight and designed to give the utmost in freedom of movement and comfort. No cemented seams to pull apart. A choice of styles and full line of sizes to fit every requirement. Unaffected by high or low temperatures.

Also available in oiled type garments if desired.

Sold by all good Dealers or write for folder CM to

A. J. TOWER CO.
BOSTON, MASS.

Makers of Waterproof Clothing Since 1836

PAY LESS FOR PUMPING DIRTY WATER!

SEND FOR NEW, FREE BOOK!

With its famous Rex Z-Metal impeller and peeler, your Rex Speed Prime pump is better fitted to stand the gaff in pumping abrasive, dirty water! The big Rex cleanout cover, the Rex big tank and other Rex features that make the Speed Prime pump the best buy are explained in the new book, "Pump for Pump, the Best Buy in '40." Send for your copy! Chain Belt Company, Dept. P-10-1664 W. Bruce Street, Milwaukee, Wis.

REX PUMPS

that calls for low cost power dependably delivered day after day is a *Cummins Diesel job.* That's why we say: THE JOB YOU WANT DONE IS NOW BEING DONE WITH CUMMINS DEPENDABLE DIESELS. Cummins Engine Company, 3616 Wilson Street, Columbus, Indiana.

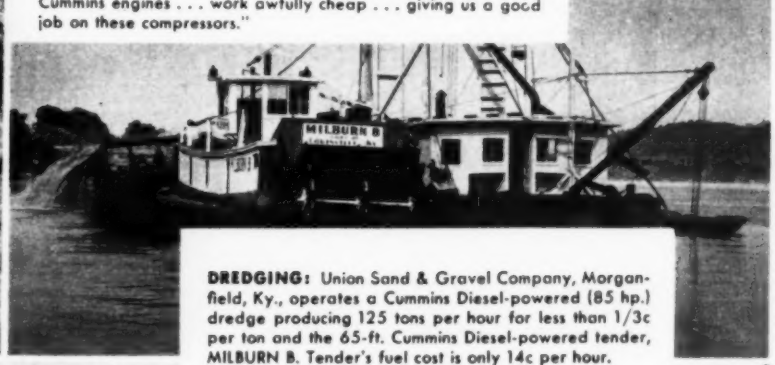
ANY JOB

DRAGLINE: G. & F. Corp., Brazil, Ind., uses a pair of 4-yd. Limas and a 2-yd. Bucyrus-Erie—all Cummins Diesel-powered—for coal stripping. The superintendent says: "Cummins Diesel power really takes the dirt . . . power is smoother, cheaper and more dependable."

Model HBIS-600 (Supercharged) Cummins Dependable Diesel. 200 hp. at 1800 rpm. Supercharging increases the horsepower one-third with no appreciable increase in weight.

AIR COMPRESSORS: C. W. Good, contractor on the Pennsylvania Turnpike, operated three air compressors, each powered with a 125 hp. Cummins Diesel. This contractor says, "I like Cummins engines . . . work awfully cheap . . . giving us a good job on these compressors."

DUMP TRUCKS: Electric Coal Co., St. David, Ill., tried Cummins Diesels in two Autocars hauling 25-ton loads, recently ordered 19 more Cummins Diesel-powered Autocars. Superintendent says, "I want Cummins Diesels. They're fast, powerful, cheap to operate."



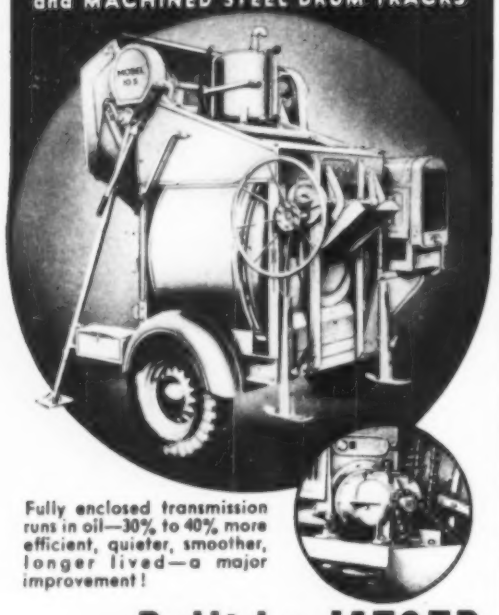
DREDGING: Union Sand & Gravel Company, Morganfield, Ky., operates a Cummins Diesel-powered (85 hp.) dredge producing 125 tons per hour for less than 1/3c per ton and the 65-ft. Cummins Diesel-powered tender, MILBURN B. Tender's fuel cost is only 14c per hour.

LOCOMOTIVES: North East Oklahoma Railway operates two 80-ton G. E. locomotives, each powered with a pair of 250 hp. Cummins Diesels. Has ordered a third similar unit. Operating cost of straight electrics formerly used, $4.43 per hour . . . the diesel-electrics, $1.66 per hour.

The Job You Want Done Is Now Being Done with CUMMINS Dependable DIESELS

MIXERS with AUTOMOTIVE TYPE TRANSMISSION

and MACHINED STEEL DRUM TRACKS



Fully enclosed transmission runs in oil—30% to 40% more efficient, quieter, smoother, longer lived—a major improvement!

. . . Built by JAEGER to Mix Faster, Trail and Handle Easier, Last Longer

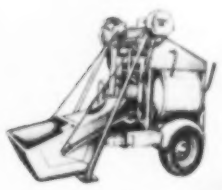
These latest SPEEDLINE Mixers — in 3½S to 56S sizes — have all the features that made Jaeger the world's biggest selling mixers, plus sensational improvements never before offered — AUTOMOTIVE-TYPE TRANSMISSION, 100% BALL BEARING SHAFTS, MACHINED ALLOY STEEL GEARS . . . plus MACHINED, HIGH CARBON STEEL DRUM TRACKS, ON CHILLED, GROUND, CAR-WHEEL ROLLERS . . . plus oversize engines and vital parts.

Here are the huskiest, smoothest running mixers ever built — combining real heavy duty service with easy handling, end discharge trailer design. 2 or 4-wheel mountings interchangeable. Get our new Catalog and prices and compare.

THE JAEGER MACHINE CO.
800 Dublin Avenue, Columbus, Ohio

Tilting Mixers 3½S, 5S, 7S Sizes

3½S End Discharge with Measuring Batch Hopper



5S Home Builders' Mixer Has All Features of Bigger Mixers

14S Trailer With 90" Wide Skip

2 or 4 Wheels

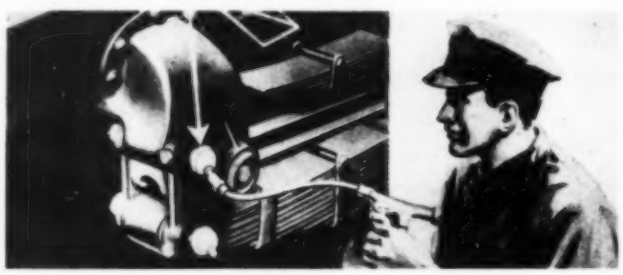
JAEGER SPEEDLINE

1940 MODEL FINISHING MACHINE. Flex-Plane unit, has following improvements: (1) sectional screed — 20-in.-wide screed is made in two equal sections. Front section can be raised to allow enough dry, fluffy concrete to pass under rear section to produce surface free from voids and tearing. With sections set together, excess concrete does not readily pass, thus saving large amount of material; (2) direct starter springs on each end of screed start screed without throwing load or pressure against forms, practically eliminating all so-called side weaving of finishing machine; (3) leaning screed wings prevent concrete from flowing over forms; (4) pneumatic-tired wheels optional.—**Flexible Road Joint Machine Co., Warren, Ohio.**

★ ★ ★

ROTARY SNOW WING for widening and sloping snow banks is driven either through power takeoff from motor which powers vehicle or may be furnished with auxiliary power plant. Snow is fed into eye of rotor located at end of wing at average speed of approximately 5 m.p.h. Rotor blades then accelerate snow to speed of 50 m.p.h. without changing direction of travel. Angular discharge from rotor is through arc of 360 deg. which assures instead of a vertical bank what is said to be an ideal 30-deg. slope, widening out 10 ft. beyond ditch line. With strong cross winds, angle of discharge of rotor can be so adjusted as to spread snow over path about 20 ft. wide, thus avoiding possibility of snow blowing in front of cab and obscuring vision of operator. This is accomplished by raising inner part of wing and lowering outer part. Makers claim that Roto Wing can displace 1,182,000 cu.ft. of snow per hour.—**Roto Wing Sales Co., Mound, Minn.**

★ ★ ★



AUTOMATIC LUBRICATOR, claimed to feed any lubricant constantly in accordance with bearing consumption, is intended for use on new equipment as well as for replacement of grease fittings or oil cups on used vehicles and machinery of all kinds. Consists of spherical steel shell with grease fitting and ⅛-in. pipe thread connection for insertion in bearing hole or suitable adaptor, of which several patterns are available. Inside shell are hollow Neophrene (grease-resistant synthetic rubber) ball and outlet channel to prevent ball from clogging outlet. When grease or fluid is forced into grease fitting, internal pressure, rising momentarily to 1,500 lb. per square inch, collapses rubber ball and compresses air within, thus storing energy for feeding lubricant to bearing. Resistance to bearing may be only 160 lb. per square inch, and consequently, ball expands and flushes lubricant through bearing until internal pressure equals bearing resistance. Expanding ball constantly presses lubricant into outlet from whence it is picked up by wiping action on bearing surfaces only when bearing is in motion, assuring long lubricated period of operation without attention. Amount of lubricant actually contained in bearing said to be small in comparison with charge remaining in reservoir, even when bearing resistances vary widely. One size, ¼-oz. capacity, now available; larger sizes under development.—**Simplex Mfg. Co., 1504 Broadway, Detroit, Mich.**

Aircraft Factory Expansion

(Continued from page 63)

tic concrete. These areas, due to the mild southern California climate, can be used virtually the entire year around for final assembly operations. Many maintenance activities likewise may be practically completed out of doors and then transferred to the plant with a minimum of interference with production. About 30 per cent of manufacturing operations can be conducted out of doors.

Completion of its expansion program brings Consolidated's manufacturing space, exclusive of field, ramp and railroad sidings, to 1,910,000 sq.ft. of covered and uncovered areas, claimed to be the largest integrated aircraft plant in the United States.

The principal contractors for the factory building and yard paving work of the Consolidated Aircraft Corp. are: B. O. Larsen, San Diego, Calif., general contractor; Consolidated Steel Corp., Los Angeles, Calif., structural steel; Macco Construction Co., Clearwater, Calif., piledriving; R. E. Hazard & Sons, San Diego, Calif., paving and grading.

* * *

STONE-CONCRETE FACING APPLIED BY Vacuum Process

(Continued from page 65)

special suction hose to the intake of an Ingersoll-Rand 420-c.f.m. compressor which maintained a vacuum of 27 in. of mercury, or about 13½ lb. per square inch, in the system.

Excess water removed from the concrete by the vacuum system was trapped at the compressor by either of two tanks connected by valve-controlled pipes into the system on the intake side of the unit. Either tank could be shut out of the system to permit drainage. Under normal operating conditions, with water being trapped in one tank, vacuum was carried in both tanks to prevent loss of vacuum when the second tank was switched into the line. The method of holding form panels required that vacuum be maintained at all times.

Before being converted to a vacuum pump, the compressor supplied air to chipping hammers used in roughening the existing concrete surfaces and in removing disintegrated concrete around corroded reinforcing steel.

Two-Course Panels—In starting concrete operations each morning, the contractor supported the first panel by jacking against the corner pilasters. As soon as concrete had been placed behind the panel, and the suction had been turned on, the pressure differential of 13½ lb. per square inch held the form in position, enabling workmen to start erection of the upper panel, which was supported by four 2x4-in. studs wedged tight in brackets on the backs of the two-course panels.

When concrete had been placed in the upper panel to the center-line seal strip, vacuum was applied in the lower half. This procedure meant that the cantilever studs never had to support much more than a 1-ft. head of concrete. As soon as concrete had been placed to the top of the panel and the entire form had been put under vacuum, the studs could be removed.
under vacuum for at least 15 min., a

At this stage, the lower panel had been sufficient period to permit release of the lower form by shutting off the vacuum. The panel then was moved to its new position and the studs were installed to hold it in place. Workmen filled the upper
Bridgeport
panel and turned on the vacuum before returning to finish the exposed concrete, from which the form had been stripped. The operation was repeated for each lift during the day.

Starting the first panel in the morning required about 1½ hr. After the first week, during which the four cement masons on the hanging scaffold mastered their double duties as riggers and finishers, the crew was able to complete succeeding lifts in about 40 min. each. Normal progress was eight panels, or 192 sq.ft., per day.

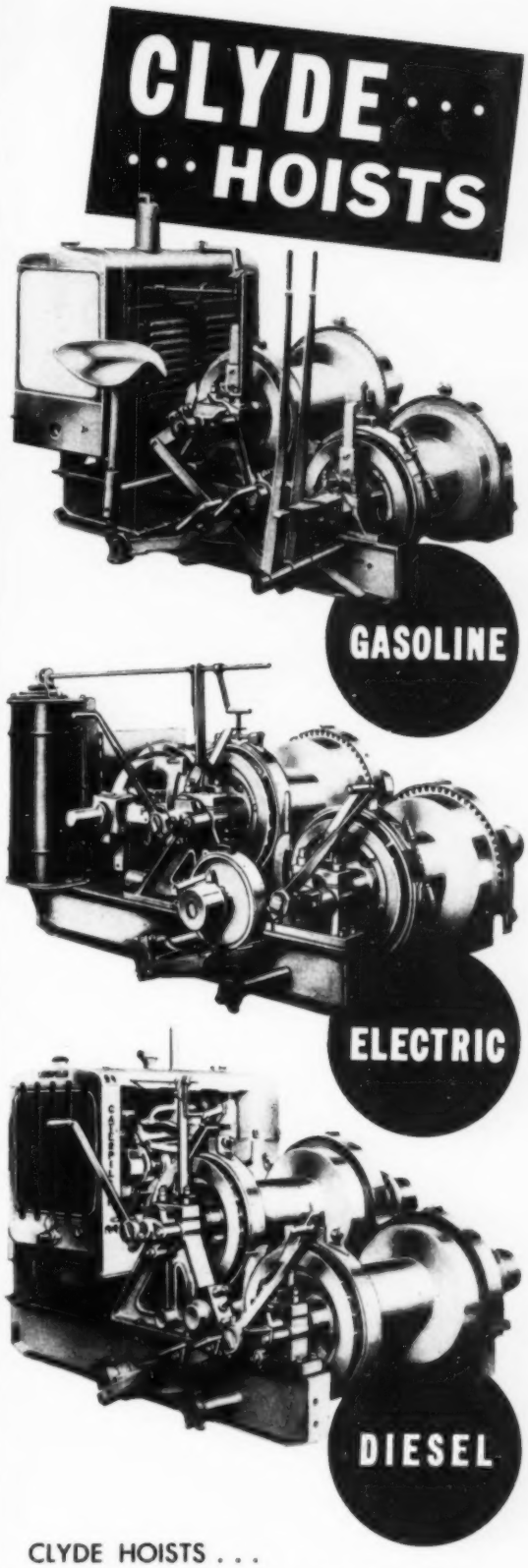
Concrete

Connecticut State Highway specification No. 4 stone, containing about 5 per cent ¾-in. size, with the remainder ½-in. and smaller, was used in the 1 : 1½ : 2½ mix. Soupy one-sack batches containing about 6 gal. of water were mixed in a 10S mixer and hoisted in a rectangular bucket, of about 4½-cu.ft. capacity, equipped with a small side gate. Each 2x12-ft. panel took about 3 cu.ft. of concrete.

Vacuum processing removed all water in excess of 3½ gal. per sack, and did not extract any more, no matter how long the vacuum was maintained. Practically no cement was removed by the process; a bare trace of milkiness was discernible in water drained from the tanks at the compressor.

Pressure of the panels against the concrete consolidated the thin facing to great density. Because the concrete set up hard behind the forms, it was necessary to finish the surface soon after removal of each panel.

Management—For C. W. Blakeslee & Sons, Inc., the work was under the general direction of W. T. Gilbert, vice-president, with G. A. Verrill, Jr., in charge at the site. Interests of the United Illuminating Co. were represented by Westcott & Mapes, consulting engineers, New Haven, Conn., with G. A. Verrill, Sr., resident engineer, in charge at the Bridgeport power station.



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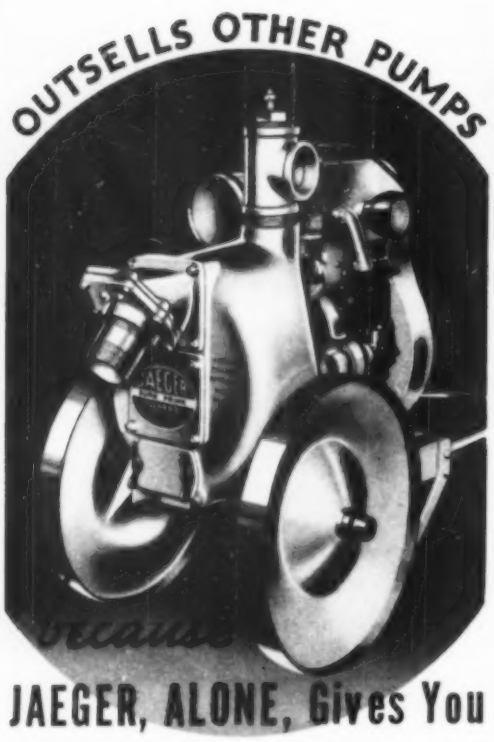

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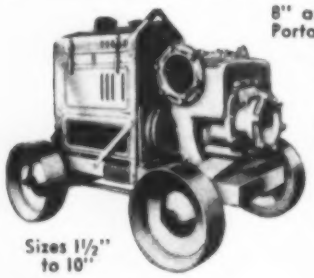

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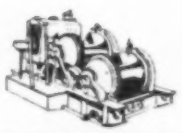
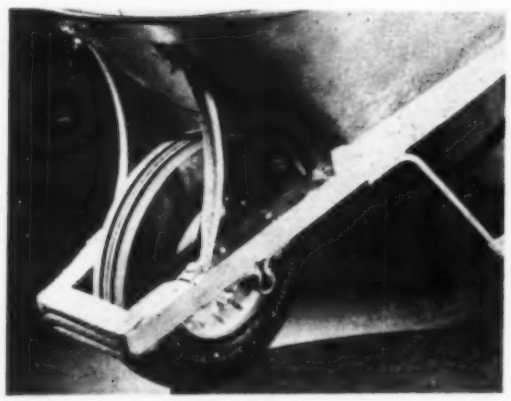


THE JAEGER MACHINE CO.

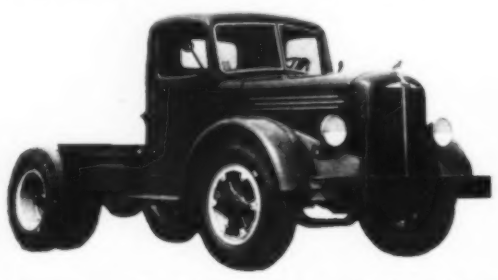
800 Dublin Ave., Columbus, Ohio



NEW WHEELBARROW TIRE, combining advantages of both pneumatic and solid types, is filled with highly resilient cushioning rubber said to eliminate hazard of tire failure from punctures or leaky valves and to require no servicing, such as inflation and repairs. Available in 16x4.00- and 16x2.00-in. sizes with carrying capacities of 645 and 240 lb. Larger unit fits lug base wheels of same size single-tube pneumatic tire. Special wheel has been designed for 16x2.00-in. size.— **B. F. Goodrich Co., Akron, Ohio.**

★ ★ ★

TRACTOR TRUCK designed expressly for tractor service is built to haul maximum gross train weight of 60,000 lb. Powered by Thermodyne 6-cylinder engine with 4¾x5¾-in. bore and stroke developing 160 hp. at governed speed of 2,100 r.p.m. Total piston displacement, 611 cu.in. Torque, 462 lb./ft. at 600 r.p.m. Larger engine developing 175 hp. at 2,000 r.p.m. at extra charge. Drive on tractor is from dry single plate 15-in.-diameter clutch through ten-speed

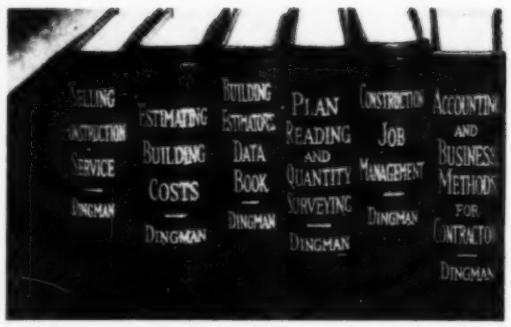


transmission. Final drive through rear axle with five rear axle ratios: 5.93, 6.46, 6.96 and 7.54. Mechanical type, air-operated brakes have total braking area of 676 sq.in. on all four wheels. High carbon steel frame, heat-treated with side members 10$^{7}/_{16}$ in. deep $^{7}/_{32}$ in. thick and 3¼-in. flange. Three box-girder and three channel cross-members. Front and rear springs 3½ in. wide. Length of front springs, 50 in.; rear springs 54 in. long. Steering gear, 21:1 ratio. Streamlined, all-metal cab with leatherette-lined rear quarters and roof, slanting V-type windshield, shatterproof glass, fully adjustable driver's seat, with leather cushions. — **Mack Trucks, Inc., 34th St. and 48th Ave., Long Island City, N. Y.**

★ ★ ★

SHOVEL-DRAGLINE-CRANE, ½- to 1¼-yd. capacity, claims two outstanding features, easy-throw levers and new type of clutch, principle of which is booster system assuring "feel" of load at all times. Other advantages: Fully inclosed travel brakes con-

trolled from cab; fully inclosed traction gears running in oil; 72-in.-diameter machine finished roller-path turntable with patented, self aligning rollers; anti-friction bearings; free floating center-pin bearings; welded steel design. Powered by heavy-duty industrial type gasoline or diesel engine. Track shoes, 24-in. standard, 30 in. optional. Smooth, self-cleaning crawlers. Quickly convertible without mechanical alteration. — **Link-Belt Speeder Corp., 301 W. Pershing Road, Chicago, Ill.**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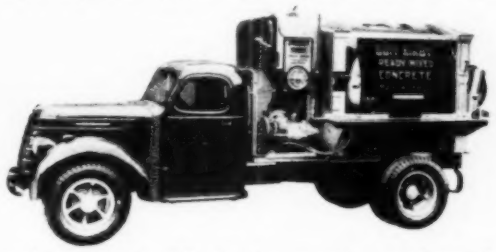
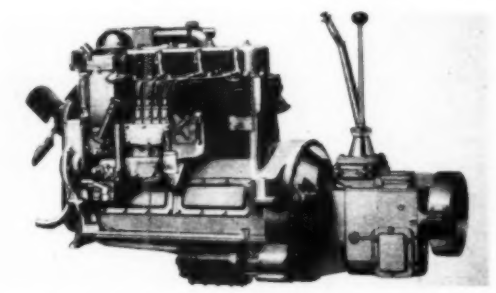
1941 MODEL TRUCK MIXERS have been designed to increase load to maximum which can be carried by trucks themselves. Loading is accomplished in one quick drop through top, and ample void space is said to be provided. Standard capacities compared with previous models: 2-yd. size replaces 1½ yd.; 3-yd. replaces 2½ yd. 4-yd. replaces 3½ yd.; 5-yd.



replaces 4 yd.; 5½-yd. size remains unchanged. Makers emphasize compactness of mixers which enables 2-yd. size with 104-cu.ft. drum to be mounted on short wheelbase, Ford-type truck. Other features: (1) Vacuum-controlled truck engine drive operated from cab with mere flip of finger (separate engine drive, if desired); (2) new Uni-valve — one accessible water control panel for mix, tempering and flush valves; (3) patented Sypho-meter water tank. **— Jaeger Machine Co., 800 Dublin Ave., Columbus, Ohio.**

★ ★ ★

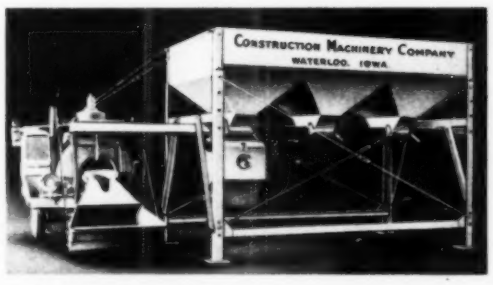
AUTOMOTIVE DIESEL ENGINE, 60-hp., is 4-stroke, valve-in-head water-cooled model with 4¼x5½-in. bore and stroke. Maximum horsepower is developed at 1,800 r.p.m., and maximum torque of 193 lb./ft. at 1,200 r.p.m. Piston displacement is 312 cu.in. Aluminum alloy pistons. Cast alloy iron block cylinder head and crankcase unit. Five main crankshaft bearings have total surface of 89.5 sq.in. Crank pin bear-



ings, 2⅝ in. in diameter and 1⅞ in. long. Equipped with crankshaft torsional vibration damper. Water circulation by pump, with operating temperature controlled by thermostat. Air-cooled type lubricating oil cooler provided, as well as pressure lubrication to all main and crank pin bearings, camshaft bearings, valve operating mechanism and timing gears. Engine fuel system features solid injection into precombustion chambers. Individual pump and valve for each cylinder. Electric starting motor, 24 v.— **Caterpillar Tractor Co., Peoria, Ill.**

★ ★ ★

LABOR-SAVING BIN BATCHER is designed to serve concrete mixers of 10S or 14S size. Portable plant employs single movable hopper hung from wheel mounting under monorail and operating back and forth underneath aggregate bins. Hopper receives weighed quantities of aggregates and delivers them



to skip of mixer under end of monorail track, as illustrated. Setup is claimed to require only two men to charge and operate mixer. Bins are loaded by crane or conveyor. Weighing scale is equipped with three separate beams for each type of aggregate, as in larger batching plants three-compartment bin has capacity of 21 tons. Overall height is 11 ft., width 7 ft. 11 in. and length, 14 ft.; height with legs removed is 5 ft. Weight is 5,000 lb. Bin gates are of double-acting clamshell type. — **Construction Machinery Co., Waterloo, Ia.**

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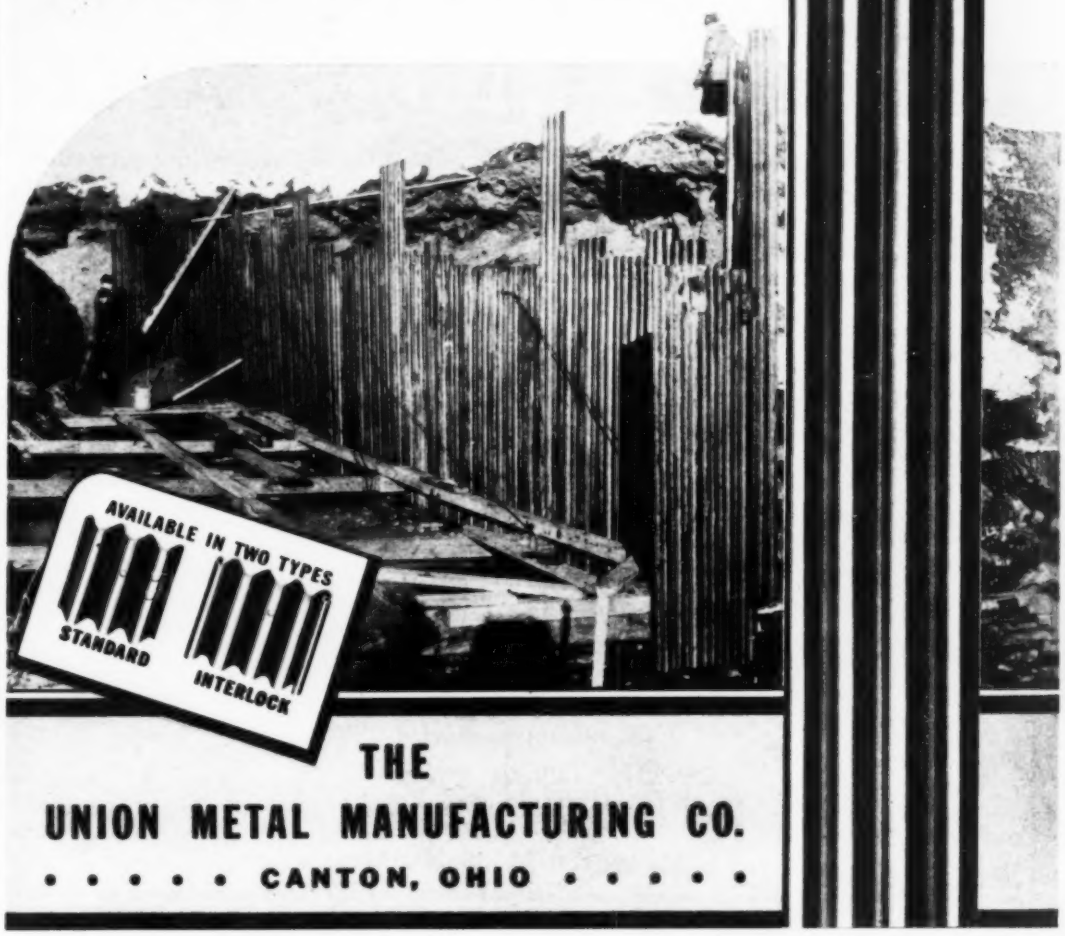

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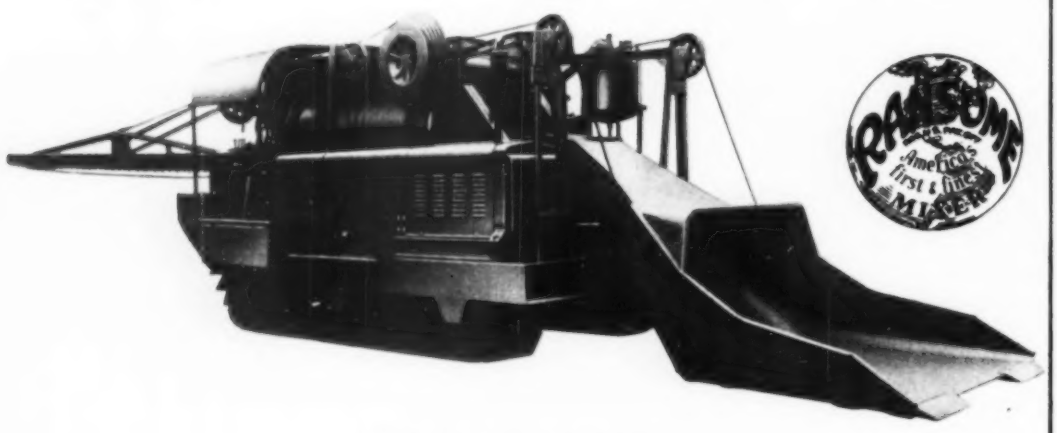
8. High carbon steel liners in shell and on mixing blades.



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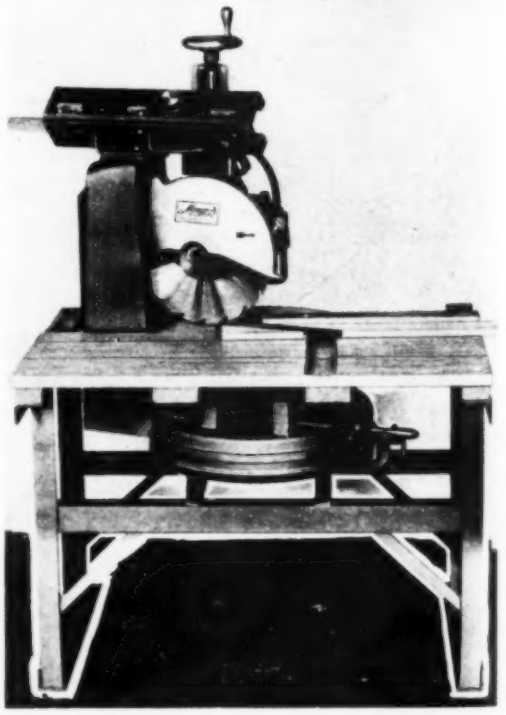
RANSOME CONCRETE MACHINERY COMPANY
DUNELLEN • NEW JERSEY

NON-SLIP SHOE for ladder users, called "Lad-R-Shoe", consists of steel plate held to wearer's shoe with leather straps. Has slip-proof bottom of rubber matting and grooved arch that grips ladder rung securely. Said to light weight, convenient standing on ladder safe, comfortable and easy on feet.—**London P. Smith, Inc., Irvington, N. J.**

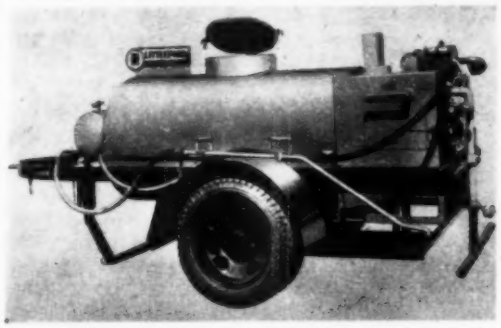
★ ★ ★

STATIONARY RADIAL SAW for use in woodworking shops, industrial departments, and of contractors and builders retains Uni-Point principle by which on all cross-cut angles, saw blade enters work at same point on table, and in addition offers following improvements: (1) column revolves to left 70 deg. which permits cutting of angles as small as 20 deg. for jack rafters and other cuts



of this type; (2) wooden fence can be removed which greatly increases capacity for wide ripping when cutting lumber up to 3 in. thick; (3) 44-in.-long bench-type stationary table gives greater surface area for measuring and work; (4) unit mounted on rigidly welded steel frame to insure accuracy and ease of operation and portability; (5) action of telescoping overarm is facilitated by dust sealed roller bearing slide construction, permitting motor arbor and saw to be pushed back obviating danger of projecting parts striking operator's head and shoulder and assuring no obstruction to vision of saw or work while in operation; (6) all adjustments made from front of machine. May be equipped with motors up to 3 hp.—**American Saw Mill Machinery Co., Hackettstown, N. J.**

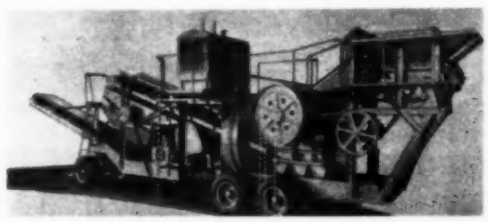
IMPROVED UTILITY SPRAY TANK, for use on all black top maintenance work or in minor construction operations, is three units in one—permits use of hand spray bars for small work, rear spray bar



for larger jobs and has draw-off cock for filling pouring pots. May also be used as pumping unit to fill drums. Three different mountings: two- and four-wheeled trailers and truck-mounted model. Sizes range from 300 to 1,200 gal. Littleford oil burners and 5-hp. motor. Can be trailed at any speed.—**Littleford Bros., 443-457 E. Pearl St., Cincinnati, Ohio**

★ ★ ★

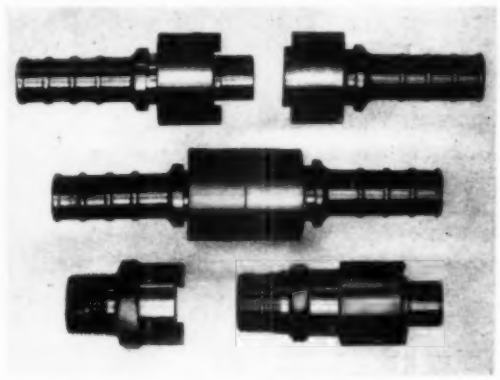
PORTABLE QUARRY PLANT, self-contained unit driven by 90- to 100- hp. diesel engine or from an auxiliary engine, receives rock direct from quarry shovel dipper to receiving hopper. Apron feeder 30 in. by 5 ft. with manual control discharges over grizzly screen, oversize rock passing to 15x24-in. jaw



crusher and undersize to belt conveyor. Jaw crusher also discharges to conveyor which delivers all material to large vertical rotor-lift that elevates product to main conveyor for delivery to 4x8-ft. single deck vibrator screen. Sized material passes screen to hopper below that feeds delivery belt conveyor. Oversize is discharged to 26x20-in. roll crusher and carried back by belt conveyor to vertical rotor-lift for recirculation over screen. This plant may be equipped with double or triple deck screen and chip eliminator, when desired. Outfit equipped with dual pneumatic tires and mechanical brake—**Diamond Iron Works, Inc., Minneapolis, Minn.**

★ ★ ★

CAST BRONZE HOSE COUPLINGS for joining similar or dissimilar sizes of rubber hose on air, water, steam and gas lines operating at up to 200-lb. pressure per square inch are being marketed under name of "Fuline" and are of interest to construction industry, railroads and public utilities. In addition to quick opening and closing features, these



couplings employ positive locking device, said to increase safety of workman. When connection is made there is claimed to be no chance of lock spring escaping from sleeve and causing possible accident. Safety feature particularly valuable when coupling is employed on air compressors and for steam connections in boiler rooms. Standard sizes are available for 3/8-, 1/2-, and 3/4-in. hose; larger sizes built to specifications.—**Pittsburgh Brass Mfg. Co., 3214 Penn Ave., Pittsburgh, Pa.**

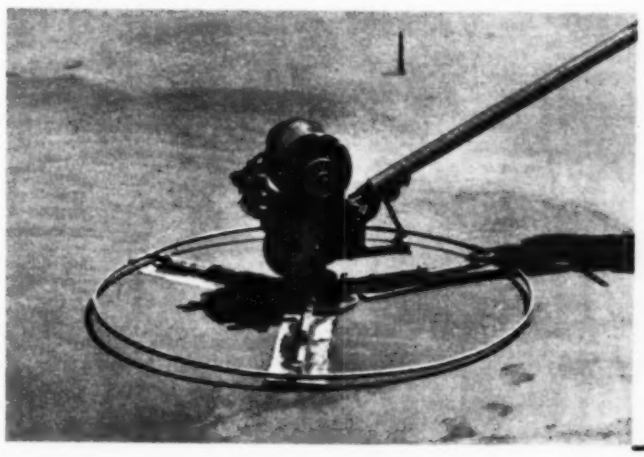
NOW—You can cover 1,000 sq. ft. of cement floor in 15 minutes!

On any job, particularly where high speed is required, the Whiteman "Precision" Finisher will pay for itself many times over—and finish cement floors despite labor shortage.

Contractors handling a western housing project of approximately 750 family units—a "hurry up" job with only 400 days allowed from "notice to proceed" until the work had to be finished—used this Finisher on the second floors of all buildings. Work on the second floor was done in the open air exposed to sun and weather. The entire building area (averaging 27 x 150 ft.) had to be finished before the concrete took its initial set. The power driven rotating trowels of the Whiteman Finisher did the job—and improved the quality of the concrete. The Finisher made special protection unnecessary as the surface was entirely finished before protection was required.

WHITEMAN "PRECISION" finisher

ELECTRIC OR GAS DRIVEN MODELS



You secure denser, more wear-resistant floors with the Whiteman "Precision" Finisher. The action of the rotating steel trowels produces absolutely level floors without high or low spots or riffles. The speed of the machine is real insurance against having floors "get away from you" when extra finishers are not available. *Ideal for Color Work,* it presses color in evenly, leaving no light or shaded spots.

Has given successful performance everywhere. Write TODAY for the name of your nearest dealer.

WHITEMAN MFG. CO.

3249 Casitas Ave.
Los Angeles, California

AMERICA'S FINEST

WATERPROOFED TARPAULINS

OUT-SELLING ALL OTHER BRANDS IN THE U. S.

YOUR EQUIPMENT DEALER CAN SUPPLY YOU

YOUR GUARANTEE GENUINE PARA PURE PARAFFIN BASE WATERPROOF TREATMENT

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SEND YOUR INQUIRIES DIRECT TO FACTORY
They will be referred to your nearest authorized distributor.

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Manufactured by

H. WENZEL TENT AND DUCK CO.

ST. LOUIS, MO.

READY TO GO...

AT LESS COST
— FASTER
— SMOOTHER

With
THOSE NEW CONSTRUCTION
PILE DRIVING JOBS FOR
National Defense

SUPER-VULCAN OPEN TYPE
DIFFERENTIAL-ACTING
PILE HAMMERS
18C, 30C, 50C and 80C

One New York contractor writes, "In actual driving the No. 1 Vulcan drove 2 ft. per minute, while the new 50C drove 6 ft. per minute. Therefore I am very much pleased with the new 50C." Similar expressions from other parts of the country show that when you use an open type Super-Vulcan you really do the job faster and with economy. You get twice the number of blows per minute — you use 25 to 35 per cent less steam—you drive more piles per dollar. The open type fit the same leads and use the same accessories as the Vulcan Single-Acting Pile Hammers.

Sizes 18C—30C—50C—80C meet all needs

Write direct to us for the important details or see the Vulcan representatives in your localities — get Super-Vulcan benefits for your work!

VULCAN Iron WORKS
Since 1852
331 North Bell Avenue
Chicago ILLINOIS

NEWS FROM MANUFACTURERS
About Their Products

The publications reviewed below, will keep you posted on latest developments in construction equipment and materials available for your use

MECHANICAL RUBBER GOODS—**B. F. Goodrich Co.,** Akron, Ohio. (24 pp., illustrated.) Includes a condensed catalog, engineering data and guide to selection of various mechanical rubber products. Typical examples of Goodrich developments in unusual applications of rubber. Three pages are devoted to a discussion of rubber transmission belting, together with instruction on how to splice the belting endless in factory, distributor's warehouse or on machine. Data include tables on minimum pulley diameters, transmission belting horsepower, a simple method for correcting horsepower ratings and discussion on selecting proper grade and type of belt. This section is followed by one on V-belt drive problems. Four pages deal with company's cord conveyor belt, endless splicing in field and shock idler mountings. Complete description of belt, recommendations on conveyor belt service, a table on conveyor belt data, and discussion and data on elevator belt problems. Six pages are given to the many types of hose and fittings for practically every type of service, with accompanying data. Remaining five pages treat other lines of products, including packing, rubber mats and matting, hard rubber sheet and pipe, rubber linings and rubber lined tanks, pipes and acid drums, rubber paints, cements, putty and plastic compounds, rubber tape, Vibro-Insulators for reduction of vibration and noise and cushion impacts, rubber expansion joint fillers and other products.

★ ★ ★

GRAVEL PLANT LAYOUTS — **Smith Engineering Works,** Milwaukee, Wis. (20 pp., illustrated.) Typical layouts of sand and gravel plants, with drawings and descriptive notes on equipment requirements. Installations include semi-portable sand and gravel washing plants, with and without crushing facilities; plant for cableway excavator; plant for general commercial use; crushed gravel plant; ground storage plant; plant for dredge operations and layouts for materials difficult to wash.

★ ★ ★

EYE PROTECTION — **Sellstrom Manufacturing Co.,** 615 N. Aberdeen St., Chicago, Ill. (72 pp., illustrated.) Extensive range of protective equipment for eyes, heads and hands, including lenses for industrial and welding use, lens holders, welders' helmets, safety shields, goggles for welding and grinding, sun glasses, rubberized fabric gloves and safety clothing.

★ ★ ★

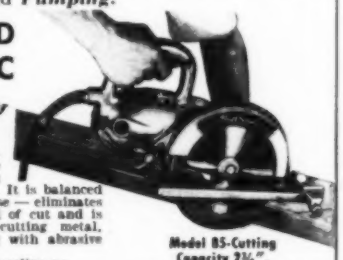
WIRE ROPE CLIPS—**American Hoist & Derrick Co.,** St. Paul, Minn. (32 pp. illustrated.) Pictures Crosby drop-forged steel clips in use in all types of jobs—from salvaging submarines to common operation of holding derrick guy and hoisting lines with safety. Relative breaking strengths of various types of wire rope graphically presented. Shows how to use clips correctly by photo and explanatory paragraphs. Lists wire rope fastening safety rules and provides table for use in assuring proper sizes and spacing of clips. Safety features listed: (1) Indestructible drop-forged steel base; (2) high, strong wings hold rope in place; (3) depressed rope channel locks grip; (4) channel grooved to lay of rope; (5) hot galvanizing resists corrosion; (6) long base for adequate grip; (7) oversize steel U-Bolt; (8) U-bolt threads galvanized; (9) heavy, smooth running nuts, easily applied.

THE PROFITABLE JOB-WINNING BIDS ARE FIGURED WITH *Mall* PORTABLE POWER TOOLS

GASOLINE ENGINE VIBRATOR
Pneumatic mounting provides unusual portability.

PROFIT-WISE contractors are solving the low-bid problem and multiplying their profits with this popular priced MALL vibrator. It saves time, labor and materials—cuts power costs, operates all day on 1½ to 2 gallons of gasoline, and places better concrete faster. The flexible shaft transmits the power to the exclusive, patented vibrating element that delivers 7000 frequencies per minute. Attachments can be furnished for ***Surfacing, Grinding, Sawing, Drilling, Sanding,*** and ***Pumping.***

LOW-PRICED ELECTRIC *Mall Saw*



You can cut your concrete form costs — save time and material with this fast, powerful saw. It is balanced for safe, one-hand use — eliminates blade binding near end of cut and is easily adaptable for cutting metal, stone, tile and sawing with abrasive wheel.

Model 85-Cutting Capacity 2¾". Other models 1⅞" to 4½".

**We make over 200 gasoline engine, air and electrically operated tools and attachments.

Write TODAY for FREE demonstration and full information.

MALL TOOL COMPANY
1717 SOUTH CHICAGO AVENUE CHICAGO, ILLINOIS

ARMSTRONG

DROP FORGED WRENCHES

In construction work there's no telling what strain a wrench may be subjected to, that's where it pays to invest on ARMSTRONG Drop Forged Wrenches — the wrenches with a wide margin of *extra strength.*

Improved in design, drop forged from special carbon steels, heat treated, hardened, tempered to the correct point of stiffness and toughness, they make work easier, faster and safer. Over 100 types, including Carbon and Alloy Steel Construction and Structural Wrenches and Ratchets. Each type in *all* sizes.

Write for Catalog

ARMSTRONG BROS. TOOL CO.
"The Tool Holder People"
334 N. Francisco Ave., Chicago, U.S.A.
Eastern Warehouse & Sales:
199 Lafayette St., New York

MECHANICAL RUBBER PRODUCTS—**Goodall Rubber Co.** (Dept. 0), 5 South 36th St., Philadelphia, Pa. (68 pp., illustrated.) New catalog covers 275 brands and specifications, with complete tabular data, including weights, on 58 items. Products include steam, air, water and suction hose, couplings and fittings, conveyor belting, transmission belting, packing, boots and clothing. For heavy construction, rugged types of hose are available for serving compressed air rock drills, riveting hammers, paving mixers and pumps, pile jetting, sand-blasting and cement gun work. Abrasive-resistant sleeves for dredge pipe lines. Flexible rubber pipe in diameters from 2 to 12 in., in 50-ft. maximum lengths. Pump diaphragms.

★ ★ ★

Twelve-Week Schedule
COMPLETES AIRCRAFT FACTORY ADDITIONS

(Continued from page 51)

connections to both buildings had to await the Labor Day shutdown of the factory, as the new circuits could not be cut in while the plant was operating on a 24-hr. basis 7 days a week.

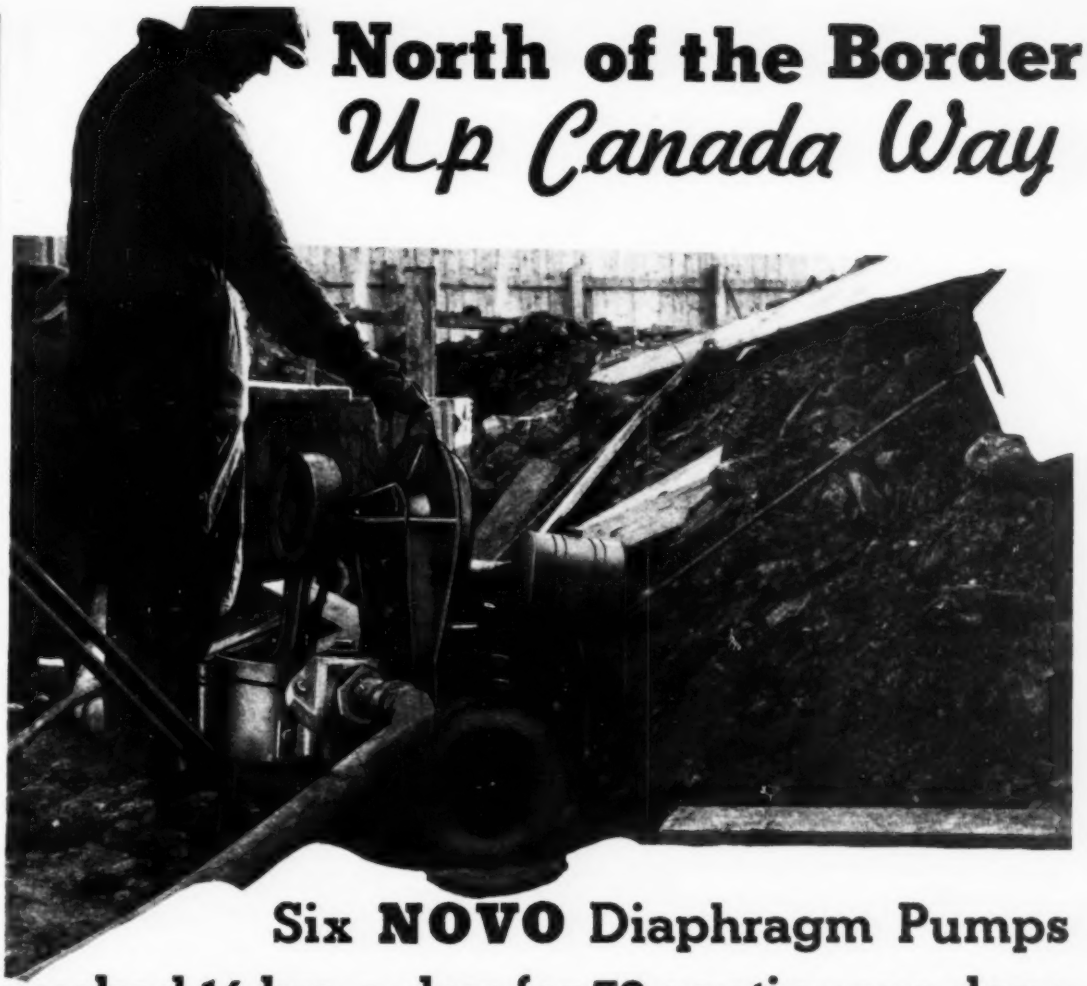
To meet the rapid schedule, first deliveries of structural steel were called for on July 1, less than 40 days after the placing of the order and at least 10 days earlier than normally expected on a fast steel job. Light grading at the site and prompt action by the general contractor enabled the foundation crew to complete 75 per cent of the column and wall footings for the first building before steel erection started, and foundation construction continued about this far in advance of steel erection throughout the length of the two additions. Swift progress by subsequent trades working in the building was marked especially by excellent cooperation of almost 30 subcontractors operating in harmony with a well-coordinated program set up by the general contractor to avoid friction and interference by overlapping activities. An accompanying tabulation lists the subcontractors.

Factory Additions

The new extensions added to two existing factory buildings at the Pratt & Whitney plant consist of steel-frame monitor-roof structures with columns on 64x64-ft. centers supporting a roof frame which features bowed trusses on 21-ft. 4-in. spacing in the transverse direction. Minimum clearance under the longitudinal carrier trusses is 14 ft. Side walls are brick and steel sash, except monitor end walls, which are Gunite. The roof is a steel channel deck covered with 1-in. cork insulation and 20-year built-up roofing of felt, asphalt and gravel.

Except for a basement cafeteria and locker room at the end of one extension, the buildings have no excavated space un-

(Continued on page 88)

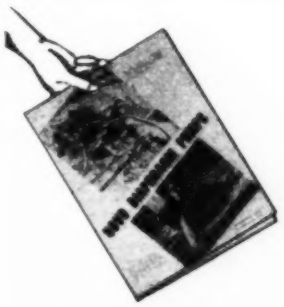


North of the Border
Up Canada Way

Six **NOVO** Diaphragm Pumps worked 16 hrs. a day for 72 continuous days

HERE is one of the 6 Novo Diaphragm Pumps used on the construction of the new Toronto Post Office by the Redfern Construction Co., Ltd., of Toronto. 16 hours a day for 72 days without a shut-down other than for changing oil and diaphragms. The pumps were 3", lift-and-force type, each having 24 feet of suction hose and handling 3,000 gallons of water per hour down to just seepage and air. These pumps were sold through Geo. W. Crothers, Ltd., Toronto.

Such a record bears out what you have been hearing on all sides about these pumps. Here is a real profit maker for the contractor. They have no close clearances to clog. They handle dirty and sand-laden water without damage to the pump. Anything that can go through the foot strainer (standard equipment on these pumps) will go through the pump, and they handle with ease their A.G.C. rated capacity.



Now, isn't that taking the worry and expense of your water handling off your mind?

Send the coupon for information and prices. Also get your copy of pump installation data.

MAY WE SEND YOU THIS BOOK OF FACTS?

● A folder containing engineering information helpful in figuring the proper pump for various installations is yours for the asking. Just return the coupon. There's no obligation.

NOVO ENGINE COMPANY
LANSING, MICHIGAN

NOVO ENGINE CO., 214 Porter St., Lansing, Mich.

Send full information on Novo Diaphragm Pumps.....

Also, folder on INSTALLATION DATA.....

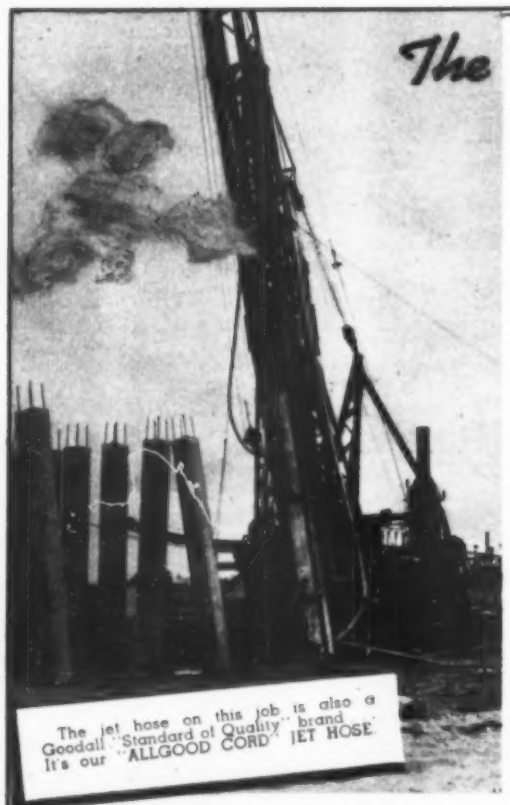
Name.....

Address.....

City.....State.....

They're the Buckets to dig with
TODAY
Watch a Haiss at work. See how the weight is placed to give GREATEST digging power. That's why a Haiss digs a bigger pay load...Write or wire for prices. All sizes.
HAISS Hi-Power

In stock at New York, Philadelphia, Baltimore, Birmingham, Atlanta, Hartford, Harrisburg & Los Angeles
GEORGE HAISS MFG. CO., INC., 139th ST. & CANAL PLACE, NEW YORK—DISTRIBUTORS EVERYWHERE



The Steam Hose is
GOODALL'S
"INFERNO"

Like the Muscle in a giant's arm, "Inferno" flexes with each lift of the mighty hammer . . . On this massive machine a length of 1½" "Inferno" hose packs all the steam power that drives the pile.

And, like the giant's biceps, "Inferno" Steam Hose will **take** a bruising blow as well as **deliver** one. Steam Hose gets more abuse on a pendulum type pile driver, such as the one shown above working in New Jersey, than on any other installation. Yet Goodall "Inferno" outlasts all others on this machine.

"Inferno" on any job is a vital artery of tough sinew . . . of char resisting rubber and duck protected by a thick rubber hide. An insulation of asbestos cord takes temperatures up to 384°F. Maximum working pressure, 200 lbs.

In case of accident, the "Inferno" construction will not burst with a bang. Instead, the escaping steam is restrained to a harmless hiss.

"Inferno" is a Life-Saving, Money-Saving Steam Hose . . . A true Goodall "Standard of Quality" Product.

Sizes	½"	¾"	1"	1¼"	1½"	2"
O.D.'s	1⅜"	1⅝"	2⅛"	2⅜"	2¾"	3⅜"
Weights per 100'	83	106	171	199	259	360

Maximum lengths of 50 feet.

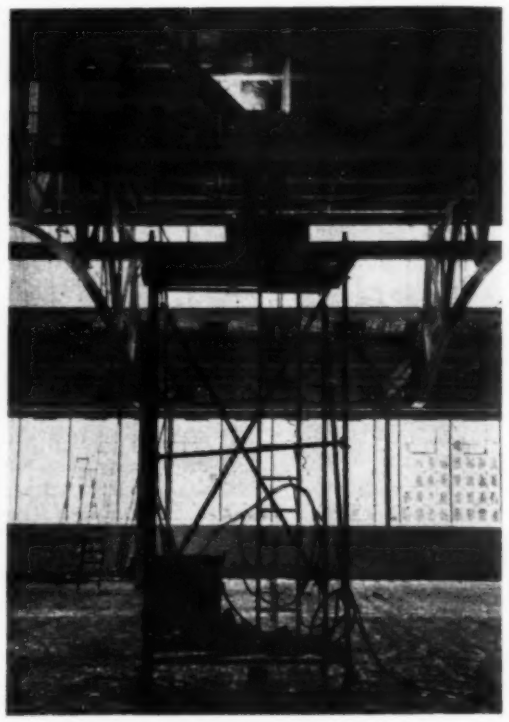
GOODALL RUBBER COMPANY
Main Office:
36th & Market Sts. PHILADELPHIA
New York Boston Pittsburgh Chicago
GOODALL RUBBER CO. OF TEXAS
GOODALL RUBBER CO. OF CALIF.
Mills: Trenton, N. J., U.S.A. (Est. 1873)

GOODALL MECHANICAL RUBBER
Write for literature on Contractors equipment.

(Continued from page 87)

der the floor, and the slab is laid directly on the ground. Column and wall footings rest on natural sand or clayey soil, good for 4 tons and figured for designed loading of 3 tons per square foot.

Ground area inclosed by the two additions is about 370,000 sq. ft., or 8½ acres. Including the basement construction for cafeteria and locker room, the total floor area involved in the Turner contract amounted to almost 9½ acres. The extensions were erected as part of an $8,000,000 expansion program; no figures on construction cost have been released.



ROLLING TUBULAR SCAFFOLDS are popular equipment units with many subcontractors. This scaffold aids welder attaching small bracket to truss.

Construction Quantities

During erection of the two factory additions in 60 working days, the contractors and subcontractors handled 10,400 cu.yd. of concrete, 2,275 tons of structural steel, 550,000 brick, 110,000 sq.ft. of steel sash and glass, 370,000 sq.ft. of steel roof deck, insulation and built-up roofing, 8½ acres of wood block flooring, and about 22 mi. of pipe for plumbing, heating, electrical and sprinkler systems.

Other quantities were in proportion. For example, the two buildings required about 42,000 lin.ft. of copper flashing, and the nailing strips for this amount of flashing totaled about 80,000 b.-ft. Roof flashing over expansion joints was accordion-fold copper protected by hinged wooden cover plates designed to flex with the joint. For about 1,600 lin.ft. of this type of protective cover over expansion joints, the job required 1,500 strap hinges.

Temporary partitions were an important item. It was essential that dustproof partitions be provided to prevent damage to precision machines and aircraft engine parts in adjacent operating sections of the buildings. A total of about 32,000 sq.ft.

(Continued on page 90)

A LOT OF PRESSURE ON A LITTLE SPOT

IF YOU could look into your gear cases while the gears are moving, you'd find a situation much like the one above. The convex surfaces of your gear teeth offer but a minute line of contact—and all the power of your engines tries to push them together.

And what keeps those metal surfaces safely apart? Just a thin film of lubricant, which has to be absolutely right for each job if it's to give those gear teeth the long life the makers built into them.

Your Shell man can help you select the right lubricant for this exacting job. He's had a wide first-hand experience with spur gears and helical gears, worm gears and herringbone gears . . . every kind of gear doing every kind of work. In recommending a gear lubricant, he always aims at two objectives: *The longest possible life for the gears. The least possible loss of power.*

Call in your Shell man today —let him start insuring a smooth life and a long one for your gears.

SHELL INDUSTRIAL LUBRICANTS

IT'S
Smooth Driving
WITH
THESE LINER PLATES

This 15-foot shaft and 10-foot diameter tunnel are part of the sewer system in a large midwestern city. ARMCO Plates can be used to line tunnels, shafts or caissons.

• Tunnel men are learning from experience that ARMCO Liner Plates help save money and avoid trouble. Let's take a look at some of the many reasons why these sturdy, low-cost plates make for fast, smooth driving.

The corrugated design of ARMCO Tunnel Liner Plates provides safe strength without excessive weight. Thus they are easy to install. One man can handle the sectional metal units, and only structural wrenches are needed for assembly. The work moves on schedule and cost estimates are often bettered.

And here are other important savings. On a strength-weight basis ARMCO Plates cost less than any four-flange type. Then in many cases you actually buy fewer plates because completed rings of ARMCO Tunnel Liner can be spaced to take advantage of self-supporting ground.

You see, ARMCO Liner Plates can help you speed work and cut costs on that next tunnel job. There is a choice of sizes and gages for light or heavy-duty service. Write us for information. ARMCO DRAINAGE PRODUCTS ASSN., 5039 Curtis St., Middletown, Ohio.

ARMCO
TUNNEL LINER PLATES

(Continued from page 88)

of temporary partition was erected, comprised of a sheathing of 5/16-in. plyscord moisture-resistant plywood dustproofed on the factory side by a lining of reinforced waterproofed two-ply kraft paper.

Grading

With the exception of the limited basement excavation for the cafeteria and locker room, grading operations consisted primarily of stripping topsoil from the area of the two buildings, taking off about 1½ ft. at one site and about 6 in. at the other. To assure required progress in this work, the excavation subcontractor put on the job as a maximum four power shovels, three tractor-bulldozers and a fleet of trucks.

No new steam tunnels had to be excavated or constructed for the two factory extensions, as tunnels previously built in connection with existing facilities provided all necessary connections to the new units. The tunnels carry compressed air and water lines, in addition to steam pipes.

Steel Erection

To unload and erect 1,050 tons of structural steel in the first building and 1,225 tons in the second addition, the R. C. Ma-

AIRCRAFT ENGINE FACTORY ADDITIONS

Contractors:

Structural Steel—R. C. Mahon Co., Detroit
General Construction—Turner Construction Co., Boston

Subcontractors:

Heating—Almirall & Co., Inc., New York
Acoustical tile—C. A. Bader, Hartford
Membrane waterproofing, roofing and sheet metal work—The Philip Carey Co., Boston
Gunite work—Cement Gun Co., Allentown Pa.
Trucking—Alfred Chiulli Trucking Co., and Roger Sherman Transfer Co., Hartford
Plumbing—C. H. Cronin, Inc., Boston
Gibraltar floor finish—De Paoli Mosaic Co., Boston
Toilet Partitions—The Ebco Mfg. Co., Columbus, Ohio
Steel sash—Fenestra Construction Co., Detroit, and Truscon Steel Co., Youngstown, Ohio
Sprinkler work—Grinell Co., Inc., Providence, R. I.
Painting—J. I. Hass Co., Jersey City, N. J.
Metal partitions—E. F. Hauserman Co., Boston
Electrical work—Hixon Electric Co., Boston
Ventilating work—The Insulation Co., Hartford
Steel roof decking—R. C. Mahon Co., Detroit
Excavation and grading—E. B. McGurk, Inc., Hartford
Elevator—Otis Elevator Co., Boston
Overhead doors—Overhead Door Co., New Haven, Conn., and J. G. Wilson Corp., Boston
Circular column forms—Pioneer Engineering Corp., Boston
Glass and mirrors—Pittsburgh Plate Glass Co., Hartford
Miscellaneous iron—Sexauer & Lemke, Inc., Long Island City, N. Y.
Wood block flooring—Southern Wood Preserving Co., Philadelphia
Cleaning windows—Sanitas Window Cleaning, Hartford

Sure . . .

It's a Jackson Vibrator

FREE—New illustrated folder just off press.

ELECTRIC TAMPER & EQUIPMENT CO.
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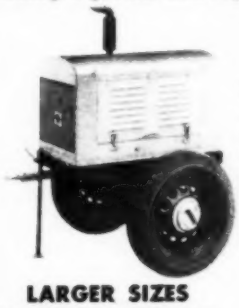
"U.S." ELECTRIC PLANTS
For Construction Work

1250 WATT PORTABLE

A made-to-order plant for construction work. Two sizes: 1250 watts and 2500 watts. For operating tools or flood lighting. Lightweight, compact, and equipped with carriers for easy portability. Air-cooled, 4 cycle, quick starting. 2 gal. fuel tank. Ruggedly built for hard usage.



WORLD'S MOST COMPLETE LINE

We are builders of the world's most complete line of Electric Plants. In all parts of the world, U.S. plants have proved their steadfast dependability. And the reason: "U.S." generating sets are designed to meet the conditions under which they will operate.

LARGER SIZES

Larger sizes are available. Illustration to the right is 5KW, 4 cylinder portable unit mounted on trailer with weather-proof hood. U. S. line includes models up to 75 KW. AC, DC, all types of controls and voltages. Write for complete information.

DIESELS

For continuous, heavy-duty service at low cost. U.S. Diesel Electric Plants offer a complete range of sizes from 3 KW to 75 KW—1, 2, 4 and 6 cylinder models.

UNITED STATES MOTORS CORP.
431 Nebraska St., Oshkosh, Wis.

hon Co. operated four cranes with 125-ft. extended booms, both truck-mounted and crawler-mounted units, under lease agreement with Roger Sherman, Hartford. Ordinarily three of the units, two truck cranes and a crawler crane, worked in unison on erection of the skeleton frame of one building, setting columns, shop-fabricated truss sections, sway-bracing and purlins. The group of three machines completed erection of the first building before moving to the second.

Concrete Construction

All concrete for the job, amounting to 10,400 cu. yd. in all, was delivered in 4-yd. truck mixers of the Edward Balf Co. from its batching plant in Hartford, on the other side of the Connecticut River, a distance of about 4 mi. from the factory.

HIGH-TENSION BUS for machine drives is erected by means of lift trucks. Bus-Way conduit containing three bar conductors allows great flexibility in making future machine connections.

Only one bridge connects Hartford and East Hartford at present, and heavy traffic conditions during working hours tended to slow down the trucks in transit. For construction of such features as footings and foundation walls, normal daytime deliveries of concrete proved adequate, but for the large production possible on floor slab construction, the contractor shifted to night delivery in order to simplify and expedite the operations.

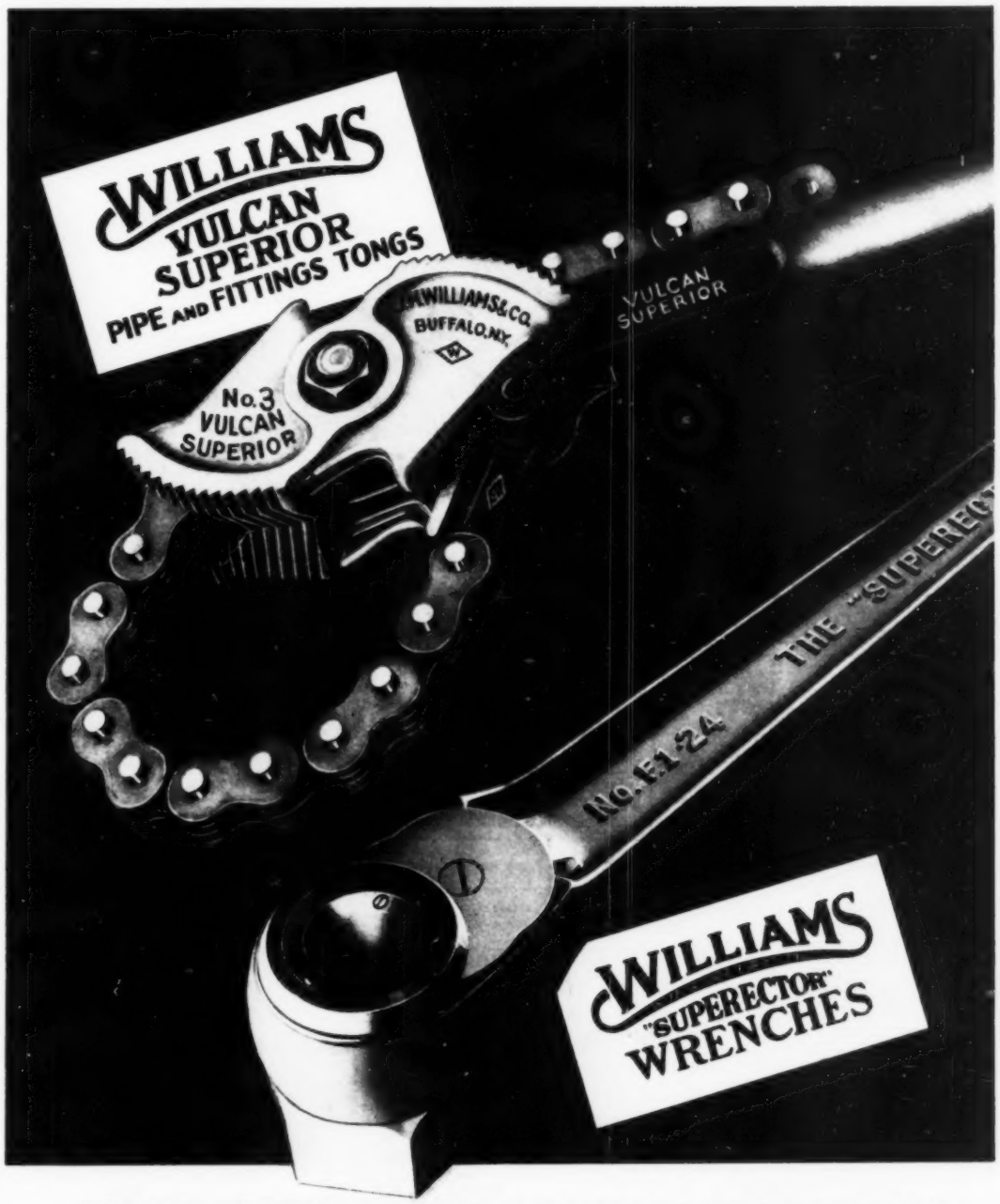
All exposed concrete surfaces (that is, all concrete work above grade) were built with plyform water-resistant plywood. In all, about 32,000 sq.ft. of plywood panel forms were used and re-used for this concrete construction.

Concrete Floor Slab

Of a total of 5,500 cu.yd. of concrete required for 5-in. floor slabs, about 5,000 cu.yd. was placed by a special second shift after 6 p.m. Three principal considerations led to the decision to place this con-

(Continued on page 92)

TOPS IN TURNING POWER



"VULCAN SUPERIOR" TONGS

When you want to turn, or hold, pipe or fittings — here's the answer. A single tong that handles BOTH — without adjustment or change of a single part. The "V" recessed jaw provides a slip-proof grip that guarantees a leak-free joint, or starts a fitting with "frozen" threads. 7 sizes—with reversible jaws — for pipe and fittings, ⅛ to 12 inches.

Also "IMPROVED VULCAN" TONGS, with double-ended reversible jaws for pipe only. 7 sizes, for ⅛ to 12" pipe.

WILLIAMS' "SUPERECTOR"

When you want real "turning power" for big nuts—hex or square—the "Superector" is your answer. This powerful reversible-ratchet wrench will turn just about anything with threads on it. Socket holes extend clear thru so you can tighten a nut all the way down on any length of bolt. 5 sizes, 24 to 53"—all with Quadruple Pawls, *drop-forged* Handle for extra strength, and other exclusive Williams' advantages. Both Hex and Square Sockets supplied with openings, 1 to 4⅝".

Sold by industrial distributors everywhere. Literature on request.

J. H. WILLIAMS & CO. HEADQUARTERS FOR 225 LAFAYETTE ST., NEW YORK

For greater dragline yardage use a Page Bucket on the job!

Dragline buckets for all types of work · Capacities ⅜ to 15 cubic yards

There's a reason why more Page Dragline Buckets are used than any other make. By their yardage records on all types of work, Page Buckets have established a reputation of being able to outdig other buckets of equal size and weight. Get the greatest yardage possible from your dragline machine — dig with a Page Automatic Bucket! See your equipment dealer or write us for more information.

PAGE ENGINEERING COMPANY

Page Automatic Dragline Buckets · Page Walking Dragline Machines

CLEARING POST OFFICE, CHICAGO, ILLINOIS

ON THE SKYLINE DRIVE

These 3 Schramm "Utility" 315 cu.ft. Diesel Driven Compressors are operating 3 Wagon Drills on the extension of the Skyline Drive in Virginia. The 3 Diesels use a total of 120 gallons of fuel oil per 10 hour day. Diesels have electric starting, of course.

(Continued from page 91)

crete after regular working hours: (1) At the conclusion of the business day, the concrete supplier could utilize his entire fleet of truck mixers to deliver the large quantity of concrete which the contractor was set up to handle in floor construction. (2) Traffic delays on the highways were reduced to a minimum during the hours of the second shift, and the full capacity of the truck-mixer fleet could be delivered to the job without undue interruption. (3) As a final advantage, no other trades were present in the buildings to interfere with progress of floor construction at night.

Delivery of concrete on the second shift started at 6 p.m. and continued until 11, 12, or 1 o'clock, depending upon the area to be covered and the rate of progress. The maximum area paved in any one day was 30,000 sq.ft., of which 22,000 sq.ft. was placed after 6 p.m., the other 8,000 sq.ft. having been laid during the afternoon.

Concrete floor slab is reinforced with wire mesh and is covered with 2 in. of wood block flooring. The live load assumed for floor design was 250 lb. per square foot.

Building Inclosure

As indicated by accompanying photographs, placing of steel roof deck, built-up roofing, monitor sash, side-wall masonry and side-wall sash followed rapidly on the heels of steel erection, completion of these elements being well along at the starting end of the building by the time the cranes had erected steel at the other end. Mechanical trades began to take over their portion of the work as soon as the steel roof deck had been laid. Plumbers, electricians, painters and heating mechanics inside the building kept pace with glaziers and roofers on the outside. Certain features of the mechanical installations are illustrated by photographs reproduced with these notes.

Labor Force

Maximum employment on the job was reached after the steel erector had departed and the painting subcontractor, along with some other subcontractors, had put full crews to work. At the peak the labor force was almost 800; the largest number reported was 789 men.

This labor force does not loom large in comparison with the number of employees at work in the Pratt & Whitney factory itself. With the additional space provided by the two new additions, the factory employs a total of 10,500 workers.

Job Organization

Two meetings a week helped to maintain proper timing and coordination of the mutiple trades engaged in the high-pressure operation of completing 8½ acres of factory additions in 12 weeks. Every Monday a meeting of the owner, architect, contractors and subcontractors was held under the leadership of the architect's superintendent, Tracy Wood, representing Albert Kahn, Inc., Detroit. This meeting set up the working schedule for the ensuing week, determined dates for

(Continued on page 94)

Again REX MAKES TRUCK MIXER HISTORY!

NO OTHER TRUCK MIXER HAS THESE!

1. **Quick-as-a-flash charging.**
2. **Ability to handle lower slump mixes.**
3. **New revolutionary mixing principle in the Rex "self-cleaning-while-mixing" drum.**
4. **Rex anti-freeze water system with positive injection of water into the heart of the batch for faster mixing.**
5. **The finest drive ever put on a truck mixer—the improved Rex Chabelco chain drive and Rex twin clutch transmission.**

Be Right—Buy Rex!

REX

NOW! A LINE OF PROVED *Hi-Discharge* MOTO-MIXERS

For over eleven years Rex has led the truck mixer field in the development of faster, more efficient truck mixers! Here's the latest, the Rex Hi-Discharge Moto-Mixer, now thoroughly proved on jobs of all sizes and types.

Rex—not you—has done the experimental work!

Not just another truck mixer—the new Rex Hi-Discharge has features never before offered on any truck mixer! Study the list at the left—a list of features you've been waiting for—found solely on these great new Rex's. Built to the newly adopted standards, the Rex Hi-Discharge gives you greater payload capacity and the greatest spouting range found on any truck mixer of equal size. *All this—plus the many Rex-pioneered advantages found on all Rex Moto-Mixers!*

Check the list of Rex features—you will see why it pays to depend on Rex for up-to-date, lower cost ways to mix, haul and place concrete! Send for free folder, "A New Era in Truck Mixer History." Address Chain Belt Company, Dept. MM-10, 1664 W. Bruce Street, Milwaukee, Wisconsin.

CHAIN BELT COMPANY OF MILWAUKEE

Hi-Discharge MOTO-MIXERS

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TRACTION! THAT'S WHAT YOU NEED

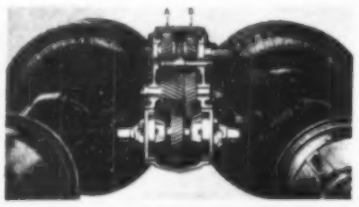
When there's heavy work to do, TWO driving axles under the load are better than one.

SAVE MONEY

Take a 1½ to 3 ton truck and quickly convert it to a husky unit of 30,000 lbs. or more gross weight capacity.

One of a fleet of five doing a real job for Goff-Kirby of Cleveland, Ohio.

with the



THORNTON Four-Rear-Wheel DRIVE

Two ratios, for power and speed. Walking-Beam Flexibility—Special spring construction keeps equal load on all four driving wheels—Perfect balance between power and weight.

THORNTON TANDEM CO.

8701-8779 GRINNELL AVE. DETROIT, MICH.

Manufacturers also of the THORNTON automatic-locking DIFFERENTIAL which gives traction when slippery going makes trucks equipped with ordinary differentials helpless.

"When you need TRACTION you need THORNTON"

Like Swapping Nickels for Dollars!

Util-A-Tool, "the tool of a thousand uses," Costs Less Than $50.00 — Actually Saves Hundreds

"Paid for itself twice on first job we used it on," writes one contractor. "As handy as an extra right arm," says another. "Well worth its cost," say all.

The Util-A-Tool pushes; pulls; bends conduit, pipe, beams, rods. Straightens bent axles and structural members; clamps parts for welding, nailing, gluing; binds loads of pipe, lumber, steel on trucks, or derricks; lifts 10-tons like a regular jack; tensions guy wires; loosens stuck and frozen objects.

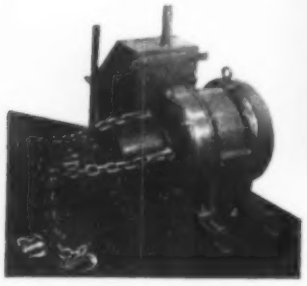
And that's only the beginning — it does so many construction and maintenance jobs it would take volumes to tell about; does them faster, cheaper, saves time, energy, manpower. New uses are reported to us daily.

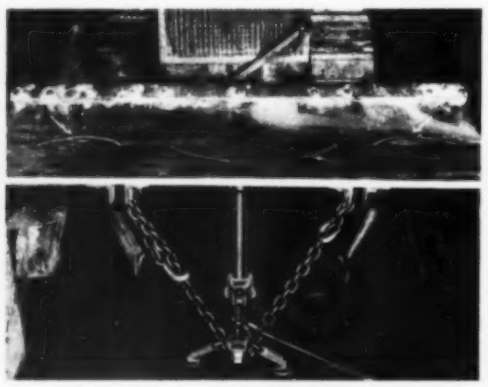
Ask your supply house for a demonstration!

Templeton, Kenly & Co.

CHICAGO, ILL.

Better, Safer Construction Jacks Since 1899





SIMPLEX Jacks

Awarded the Gold Medal for Safety

Send for Simplex Catalog 40.

(Continued from page 92)

deliveries and completion, and served to eliminate all conflicts and confusion.

A second weekly meeting was held in the field office of the general contractor each Saturday. Attending these meetings were the supervising members of the field organization and representatives of the contractor's operating and purchasing departments from the Boston office of the Turner Construction Co. Problems of delivery, operation and general handling of the job were thoroughly discussed at the meetings, and responsibility for every item and phase of the work was allocated. Minutes of these meetings formed a complete record of progress and problems to date and laid down the schedule of construction for the future. R. F. Egelhoff, superintendent, directed operations for the Turner Construction Co., and Charles L. Burns, of the United Aircraft Corp., was in charge of construction for the owner.

* * *

Wood Panel Forms FOR BUILDING CONCRETE DAMS

(Continued from page 67)

It is not always necessary to separate formwork into three types. For practical cost control purposes, one or even two of the three types named may be insignificant in quantity, and satisfactory comparative cost can be obtained by simply grouping them, cost and quantity, with the cost and quantity of the predominating type. Good judgment should be used in the selection of types and only such breakdown made as will be justified by the results. It is possible to attempt too great refinement of costs, resulting in records which are likely to be confusing and questionable.

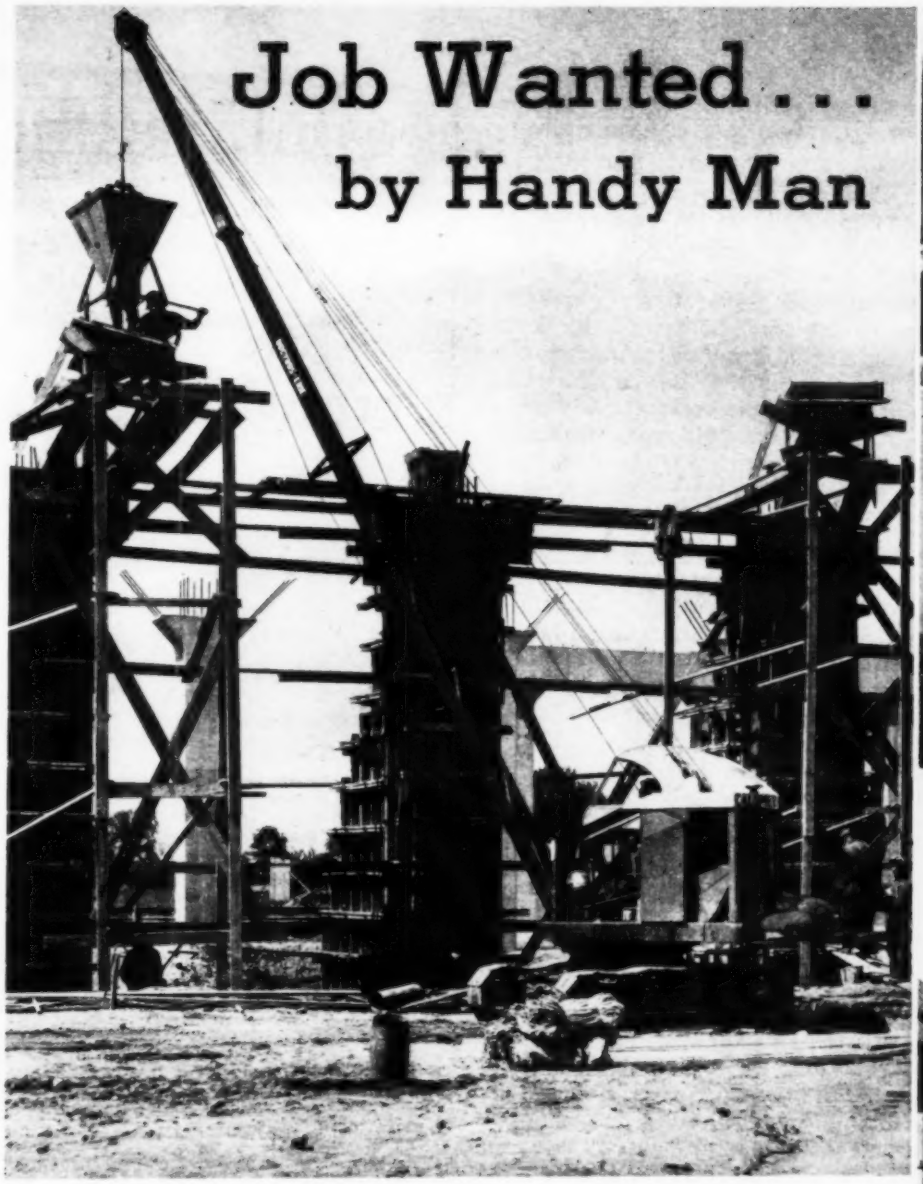
Information Required

At the time when formwork begins, the cost engineer requires, for each class of concrete, information which will answer the two following questions: (a) What is the estimated overall contract area of formwork per cubic yard? (b) What percentage of the total form area will be built with: (1) panel forms, (2) built-in-place forms, and (3) specials?

Whenever a report on formwork costs is to be issued (daily, weekly or monthly) the cost engineer requires the following information for each class of concrete: (A1) total square feet of formwork of each kind which has been erected as of the date of the report, whether still in place or not; (A2) total square feet of formwork of each kind actually in place at the date of the report, whether filled with

(Continued on page 96)

Job Wanted . . .
by Handy Man



Handy man around the job . . . the Bucyrus-Erie 10-B can travel on own cats at 4¼ miles per hour.

Traveling man of the outfit . . . loaded and ready to go in 15 minutes — need no permit on special transportation wheels in most states.

Quick-change artist to fit your work . . . shovel, dragline, crane, clamshell, dragshovel or skimmer in the time it takes to lower the boom and pick up a new one . . . shovel to crane change usually in less than two hours.

Quick, active, accurate, on large jobs or small . . . write for full information on this ⅜-yard winner.

Bucyrus·Erie

SOUTH MILWAUKEE, WISCONSIN

BUCYRUS ERIE

PONY

Solid Shank
FEATHERWEIGHT
Shovels

PERFECT BALANCE

A new redesigned socket gives to the PONY Solid Shank Shovel the perfect balance which no other solid shank shovel has.

Equipped with
SHOCK BAND

The famous ABW Shock Band gives to the shovel greater handle strength. This is a patented feature of PONY Solid Shank Shovels.

Ask Your Jobber

AMES Since 1774

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Parkersburg, W. Va. North Easton, Mass.

ABW PRODUCTS
SHOVELS FORKS
SPADES HOES
SCOOPS RAKES
POST HOLE DIGGERS
AGRICULTURAL HANDLES

(Continued from page 94)

concrete or not; (A3) total cubic yards of concrete poured. For ease in utilizing this information it is suggested that two of the items, A1 and A3, be reported in two ways: (1) total this period, and (2) total to date.

Axiomatic as it seems, it is surprising that the engineer responsible for quantities does not always understand that correct quantities are equal in importance to good and correct distribution of expenditures if correct unit costs are to be reported. Not only are unit costs worthless if not based on quantities that correspond to the distribution of the costs, but, even worse, they may be very misleading and result in considerable error when used.

Information Furnished

Let us assume for the moment that on a lock job in response to the first two questions the cost engineer has received the information given in the accompanying Table I, Estimated Form Area. Let it further be assumed that, at the end of the first month, the job engineer supplies to the cost engineer the data contained in Table II, Job Engineer's Report—Month of June.

By applying the quantities shown in these tables to the accumulated expenditures for labor and materials as recorded in the job ledgers, the cost engineer is now ready to issue a cost report on erection and stripping of various kinds of formwork. This cost information, as presented to the management, is shown in the accompanying Table III, Form Cost Report—Month of June. Erection and stripping costs are summarized in a supplemental report (Table IV) to show the total field costs per square foot contact area for each type of form.

These reports give the management information regarding the form costs per square foot. (Various cost analyses will furnish the details of the breakdown of each unit cost per square foot for erecting and stripping the various kinds of formwork into labor, material, machine time, expense, etc.) Now it is necessary to advise the management what these square foot costs mean as components of concrete costs. Here is where the cost engineer makes use of the data on estimated form area furnished by the job engineer.

Overall contact area has been estimated to be 3.20 sq.ft. of form area per cubic yard of lock concrete. Of this 3.20 sq.ft., it has been estimated that panels will be used for 60 per cent of it, built-in-place forms for 17 per cent and special forms for the remaining 23 per cent.

In other words, for every cubic yard of lock concrete poured, the following amounts of the various kinds of formwork will be needed:

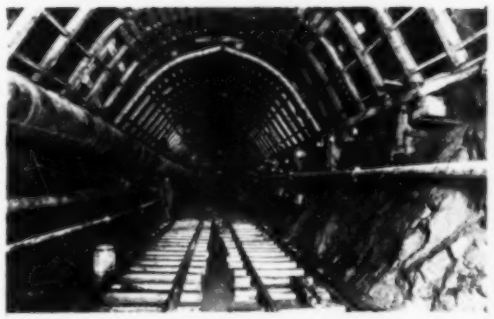
Panel	60 per cent of 3.20 sq.ft. =	1.920 sq.ft.
Built-in-place	17 per cent of 3.20 sq.ft. =	.544 sq.ft.
Special	23 per cent of 3.20 sq.ft. =	.736 sq.ft.
Total	100 per cent of 3.20 sq.ft. =	3.200 sq.ft.

By multiplying the amount of area for each kind of form by the unit cost per square foot for that same kind of form, the cost engineer can indicate final form-

COMMERCIAL

GIVES YOU *EASIER, FASTER, AND SAFER* CONSTRUCTION ON...

...JOBS SUCH AS THE DELAWARE AQUEDUCT!



● The above photograph shows how COMMERCIAL Tunnel Supports are playing an efficient part in the construction of the 85-mile rock tunnel being driven for the Delaware Aqueduct. The length of such a tunnel as this places a premium on careful preplanning . . . makes selection of dependable, economical equipment and methods a necessity. Thus the choice of COMMERCIAL for tunnel supports. Their time, labor and money saving abilities have been demonstrated on *hundreds* of tunneling projects. They fit any type or size Tunnel. Write for details.

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YOUNGSTOWN, OHIO

THE OTHER PUMPS QUIT

Results mean more than words. Talk is cheap and anyone can make a lot of unproved claims. But on the job a pump must do its own talking. Try out a G & R pump and then you be the judge.

GORMAN & RUPP PUMPS
ENGINEERED FOR PRODUCTION SERVICE

AGAIN THE CONTRACTORS BOUGHT GORMAN-RUPP

On the new Shore Parkway project at Brooklyn two centrifugal pumps one an 8-inch and the other a 4-inch, clogged and quit. Two "Can't Clog" G & R 6-inch pumps replaced the quitters and for weeks pumped 24 hours per day.

Gorman-Rupp Pumps Can't Clog. They are not quitters. That's why MORE CONTRACTORS ARE STANDARDIZING ON GORMAN-RUPP PUMPS THAN ANY OTHER MAKE. They will pump MORE WATER and pump MORE HOURS at LESS COST.

Let a Gorman-Rupp Pump prove these statements. Phone our nearest distributor for a trial pump.

PROMPT DELIVERY from Stock in 100 Principal Cities

THE GORMAN-RUPP CO. Mansfield Ohio

work costs per cubic yard of concrete, based on the assumption that the square foot costs of formwork remain constant. The computation of the indicated final cost of formwork per cubic yard of concrete is shown in Table V.

It may be argued by some that this method does not provide the cost of formwork per cubic yard of concrete for individual months in which the contact areas to inclose the concrete may vary. This contention is admitted; the cost of formwork per cubic yard of concrete for individual months is obtainable, but its value for executive control is questioned, particularly when the square foot cost, which is the controllable component, is given. If the job management requires the additional information on cost of formwork per cubic yard of concrete for individual months, it becomes necessary for the cost engineer to know the square feet of formwork erected and not poured at the date of the report. The work required to determine this quantity may or may not be worthwhile, as the cost obtained is not comparable with any estimated or budgeted figure and is useful mostly to satisfy curiosity and not to aid executive control of cost trends.

Formwork Chart

A formwork chart showing "To Date" actual ratios of panels, built-in-place and special forms should be supplied to the management monthly to assist in watching trends and controlling percentages of use. Appreciable deviations from scheduled percentages of use should be watched by the cost engineer, and deviations which will affect the final ratio should be reflected in his statement of indicated final cost of formwork per cubic yard of concrete.

Occasionally a more costly type of formwork is used where it would be possible to use a less expensive type. The importance of the ratio of the types of forms used does not always receive due consideration. A monthly formwork chart provides a periodic comparison of the relation of the types of forms erected to a "bogey" established at the beginning of the work. The varying percentages of these component types of formwork affect the cost of formwork per cubic yard just as the varying costs per square foot of formwork do, although less seriously.

Acknowledgements

Acknowledgment is made to Hal W. Hunt, formerly of the Construction Plant Division, to R. E. Martin and Hugh R. Kinzer of the Construction Plant Division, and to the several members of the project field engineering and construction organizations who, through their research and studies, developed some of the data included in this article.

Special acknowledgment is given W. J. Bailey, office engineer at Cherokee dam, H. L. Broadfoot, assistant construction engineer at Kentucky dam, and H. T. Lofft, assistant construction engineer at Watts Bar dam for many field designs and tests that were the bases of some of the develop-

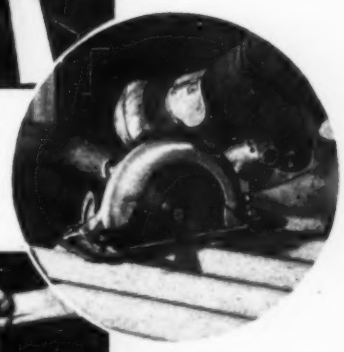
(Continued on page 98)

Using No. 85 Quick-Saw for squaring ends on sheathing around tool shed.

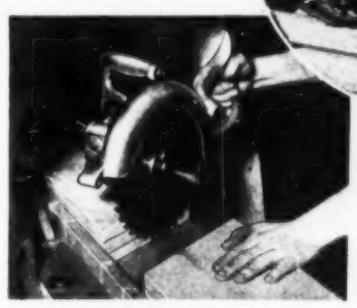
CONSTRUCTION MEN will tell you Black & Decker's New QUICK-SAW can't be beat, for cutting costs on sawing concrete forms, scaffolding, falsework and other similar cut-off and framing jobs. Finishes jobs way ahead of schedule — time saved is money made! QUICK-SAW is operated with one-hand, cuts to a 2⅝" depth, saws 2x4's on full 45 degrees — depth and angle of cut quickly adjusted. Telescoping blade guard keeps it always safe. Operates from electric socket or portable generator. Black & Decker has three other models for every type of job, from light trim work to extra deep, heavy-duty sawing. Ask your jobber to demonstrate the best saw for your purpose—or write: The Black & Decker Mfg. Co., 759 Penna. Ave., Towson, Md.

FREE SAW HANDBOOK shows many ways to use saws to speed up work and cut costs. Send for your FREE illustrated copy today!

Mounted on a portable saw table, the No. 85 Quick Saw is adapted to a variety of fast, accurate sawing jobs.



Using No. 75 Black & Decker Saw with abrasive disc to cut corrugated asbestos-cement quickly and smoothly.



Sawing a diagonal cut in stack of three 1" boards — illustrating the extreme depth of cut of the No. 95 model saw.

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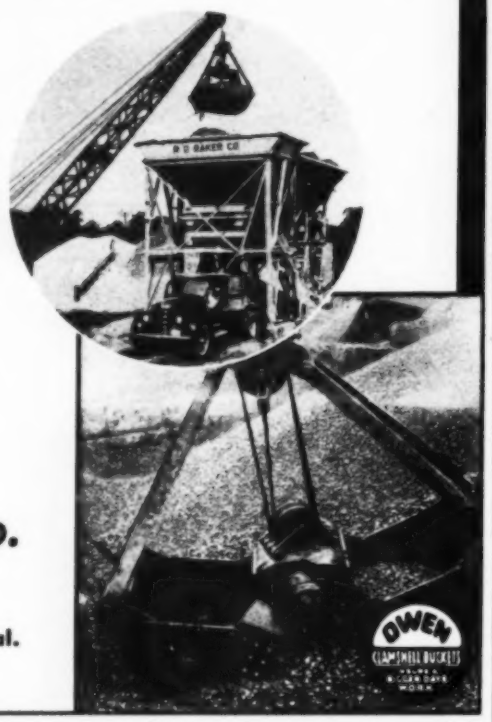
Black & Decker

PORTABLE ELECTRIC TOOLS

A MOUTHFUL at EVERY BITE and Less Bites per HOPPER



VALUE RECEIVED in terms of re-handling buckets implies, capacity grabs in shallow materials, rapid dumping and clean-up action and a long life of profitable service to the user.

We have a long list of satisfied OWEN owners who are eagerly acclaiming "Value received".

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3 Reasons why You're ahead with

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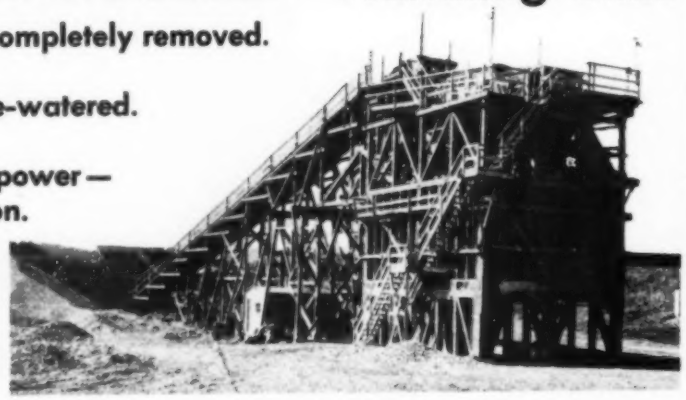
SAND and GRAVEL Washing and Handling Units

1. Foreign substances completely removed.
2. Sand thoroughly de-watered.
3. Saves head room, power—simplifies distribution.



The best results in cleaning sand and gravel are obtained through the use of Reliance System Revolving Screens and Paddle Type Boxes. Clay, loom and other foreign matter is completely removed and floated away. The sand is de-watered while being carried to the storage bin. The single sizing screen saves head room and power and simplifies distribution to storage. Send for Catalog No. 11.

UNIVERSAL ROAD MACHINERY CO.
KINGSTON, N. Y., U. S. A.

Distributors in ALL principle cities of the U. S. A.

RELIANCE PRODUCTS

Reliance offers a complete line of Rock Crushers; Bucket Elevators; Revolving Screens; Storage Bins; Pulverizers; Chip Spreaders; Heating Kettles; Bin Gates; Feeders; Belt Conveyors; Grizzlies; Air Separators; Sand and Gravel Spreaders; Wash Boxes.

(Continued from page 97)

ments of this report. Special acknowledgment also is given F. C. Schlemmer, formerly construction superintendent at Chickamauga dam, now project manager of the Watts Bar project; George P. Jessup, formerly construction superintendent at Guntersville dam, now project manager of the Kentucky dam; and J. E. Walters, formerly construction superintendent at Hiwassee dam, for their advice and counsel regarding the field applicability and use of the forms from which many of the ideas of developments were obtained.

TVA Organization

Headed by Dr. H. A. Morgan, chairman, and David E. Lilienthal and James P. Pope, directors, the Tennessee Valley Authority operates under the direction of the general manager, Gordon R. Clapp. The engineering and construction program is directed by Theodore B. Parker, chief engineer, and all field engineering and construction are under the general supervision of A. L. Pauls, chief construction engineer. R. T. Colburn heads the Construction Plant Division, including the Costs and Estimating Section of which the author, H. P. Maxton, is the chief.

★ ★ ★

JOB YARD BUILDS 7,200 Roof Trusses

(Continued from page 53)

The general contractor called for bids on the 7,200 trusses from subcontractors and got figures as low as $4.50 per truss. However, the work was not sublet.

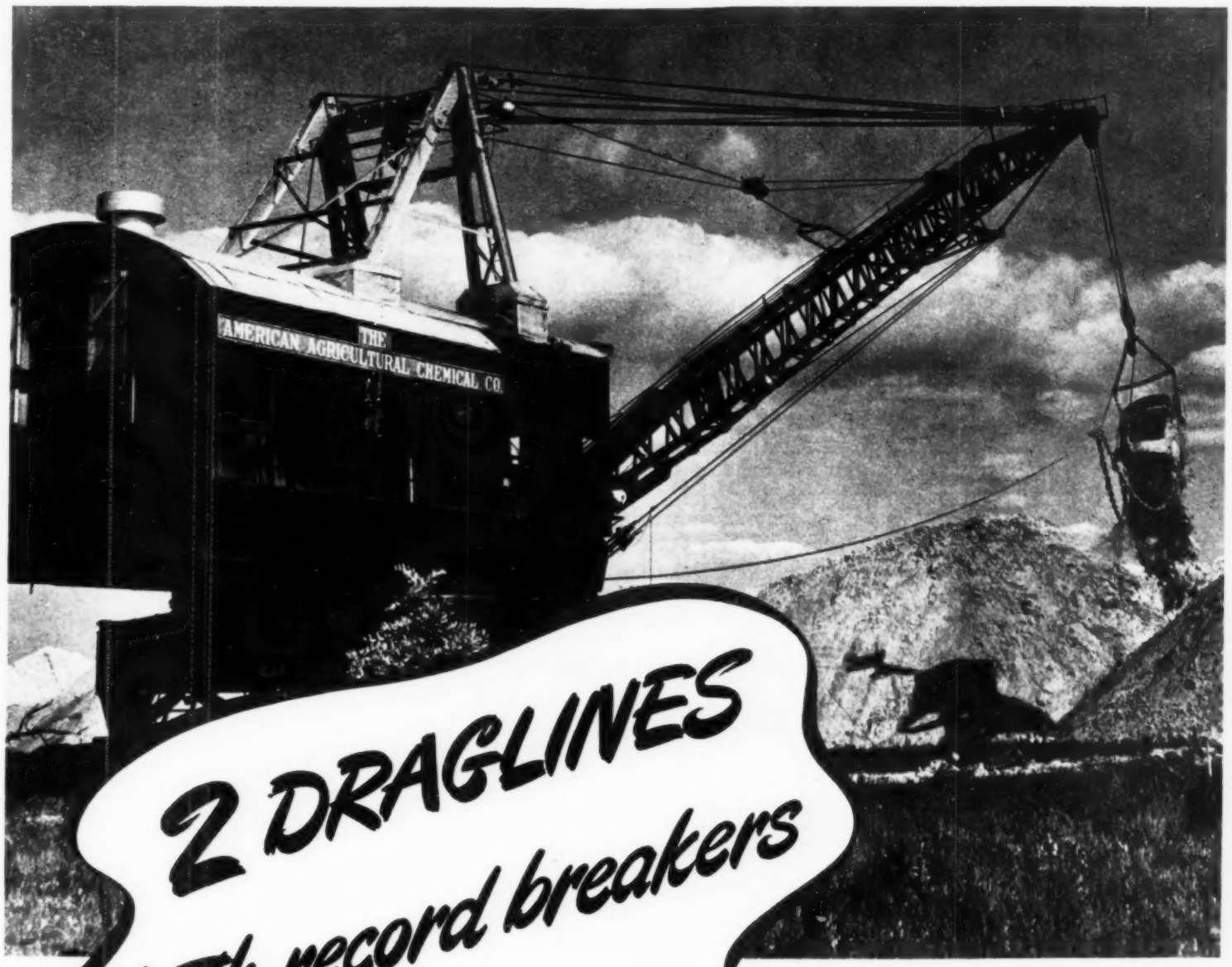
To make the truss assembly as simple as possible, a long bench has been equipped with power-operated tools, as shown in an accompanying picture, and a crew of five carpenters and two laborers does the necessary cutting, boring and grooving. At the far end of this "production line" the

FINAL TIGHTENING of nuts is done with ratchet wrench. Average production rate (including all operations) is twenty trusses per hour with nine carpenters and two laborers.

truss members are piled near the two assembly jigs where a crew of five nails, bolts up and stacks the trusses. The average rate of production, including all operations, is twenty trusses per hour.

In piles of seven the finished trusses are picked up by lumber carriers and delivered

(Continued on page 100)



2 DRAGLINES both record breakers

and both PURPLE STRAND

American Agricultural Chemical Company tried a number of different brands of rope as dragline on this giant phosphate shovel . . . and kept a careful record of the yardage handled by each brand.

Some months ago, the first Bethlehem dragline—210 feet of 2 in. Purple Strand—went into service. Purple Strand passed the "expected yardage" record—a figure based on the average performance of the six previous draglines which had been used on the jobs. Then Purple Strand went on to smash the best individual record of any dragline by a tremendous margin.

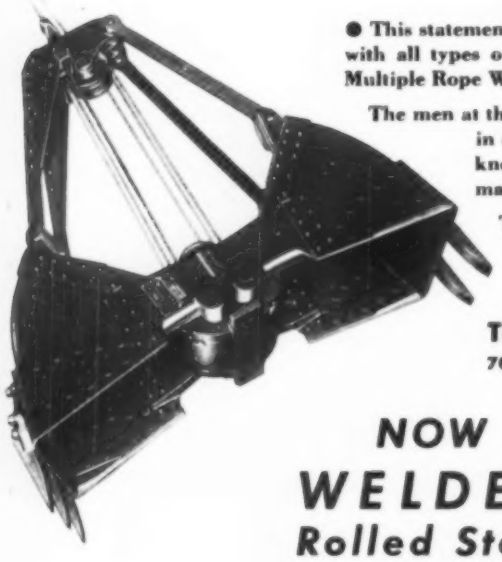
A second Purple Strand dragline was installed and like the first one, it beat the best previous record by a substantial margin.

Of course, all Bethlehem wire ropes can't be record breakers. But all Bethlehem wire rope can and will deliver long average service, rope after rope, month after month. If you plan to buy dragline—or any other type of wire rope—give Bethlehem rope a try. We're satisfied to let the performance of our rope speak for itself.

BETHLEHEM STEEL COMPANY

BETHLEHEM STEEL

"IT DIGS AND FILLS BETTER IN SHALE AND ROCK THAN ANY BUCKET I HAVE EVER USED"



● This statement came from a crane operator who for 25 years has worked with all types of buckets. The bucket which won his praise is a ¾ yard Multiple Rope Williams Bucket used by F. F. Mengel Co., Wisconsin Rapids.

The men at the controls know how Williams Buckets can help make time in digging and moving yardage. The men in the "front office" know how Williams Buckets stack up in long service and low maintenance cost.

They're "Built to Last and Move Dirt Fast"

Bulletins describing all types of Williams Buckets sent free on request

THE WELLMAN ENGINEERING COMPANY
7017 Central Avenue Cleveland, Ohio

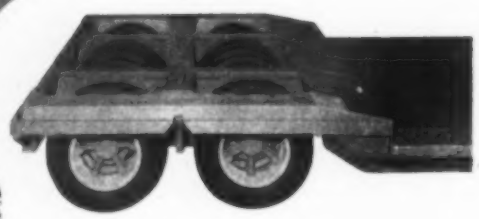
NOW WELDED Rolled Steel Construction

WILLIAMS *Buckets* built by WELLMAN

HOW ROGERS EXPANDS *trailer* USEFULNESS

● Rogers builds trailers, conforming to the 8 ft. *legal limit* of many states, in capacities up to 60 tons—but they need not be limited to 8 ft. loads.

Welded steel brackets shown above may be swung out in a few seconds to receive side members.



● Above is shown the newly improved design of expandable trailer — with 20 side brackets supporting non-skid wooden side members — an 8 ft. trailer expanded to 10 feet.

After hauling an extra wide load the side members are removed and the brackets folded compactly against the trailer, which returns more quickly than would otherwise be possible.

EXPERIENCE ...built it
PERFORMANCE ...sold it

ROGERS BROS. CORP.
220 ORCHARD ST. • ALBION, PA.

(Continued from page 98)

to the several buildings where they are set in place by crawler cranes.

Contractors on the job are Barrett and Hilp, San Francisco; H. J. Brunier is structural engineer and Roller and Stringham architects.

★ ★ ★

Belt Conveyors FOR CONSTRUCTION OPERATIONS

(Continued from page 59)

The foregoing angles apply for average belt speeds of 250 ft., per min. The materials can, under certain conditions, be conveyed at slightly steeper angles.

Belting.—In selecting a belt for a given installation, the number of plies, weight of duck, friction pull (adhesion) between plies, tensile strength, and thickness of covers must be considered. Safe working tensions are listed as follows:

ALLOWABLE TENSION
(Pounds per ply per inch of width)

WEIGHT OF DUCK, OUNCES*	TENSION
28	27
32	30
36	34
42	40

*Weight of a piece 36 in. long in the warp by 42 in. wide.

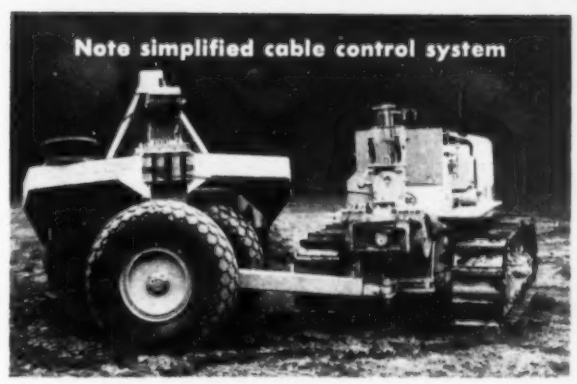
The several brands of belting manufactured by various rubber companies are classified by friction pull or adhesion between plies and tensile strength of covers. A method of determining the adhesion between plies consists of testing a belt sample 1 in. wide and at least 6 in. long by attaching a specified weight to a ply and timing the rate of separation with a stop watch. The rate of separation is not to exceed 1 in. per min. The tensile strength of the various brands of rubber cover varies between 300 to 4,000 lb. per sq. in. Durability, resistance against abrasion, and life of the belt are proportionate.

Stepped-ply belts are recommended where the belts are subjected to excessive abrasion at the center or on long, narrow, lightly loaded conveyors on which improved belt troughing is desired. A stepped-ply belt is designated by specifying the number of plies at the center of the belt and the number at each side, *viz.*, 5x7, 7x9, etc. For design purposes, a 5x7 stepped-ply belt is equal in strength to a 6-ply belt, a 7x9 to an 8-ply belt, etc. The thickness of rubber on the top side of belting is usually ⅛ in., or greater, in the heavy-duty class.

Idlers — A good installation of idler

(Continued on page 102)

Equip yourself for BIGGER PROFITS invest in HEIL DIG-N-CARRY SCOOPS



The complete line of Heil Road Machinery includes heavy duty, Dig-N-Carry dirt moving units that load fast — dump fast — cut and spread accurately — turn in a short radius — hitch and unhitch easily — incorporate construction features that insure long time, low cost service under the toughest kind of operating conditions. Dependable Heil operating advantages are helping contractors everywhere do top quality, clean-cut work RIGHT ON SCHEDULE. Equip YOURSELF for profitable operation with Heil Quality-Built Road Machinery. Send today for free catalog covering Heil Cable Scoops, Heil Hydraulic Scoops, Heil Trailer Scoops, Heil Trailbuilders and Bulldozers, Heil Tamping Rollers and Heil Hydraulic Dump Units.

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RUSH SHIPMENT of Heil Dig-N-Carry Hydraulic Scrapers for export. Contractors have proved to their own satisfaction that the efficiency and dependability of Heil Hydraulic Scoops means lower dirt moving costs. The guaranteed Heil Hydraulic systen provides safe, speedy, finger-tip control of every operation.

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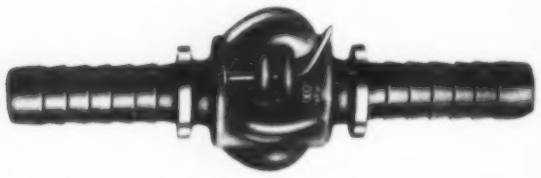

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HOSE COUPLING

The "AIR KING" Coupling will save time, trouble and expense on every job that requires frequent coupling and uncoupling of hose to maintain service. A push, a quarter turn, and the connection is made. Then to make it absolutely safe, the heads can be quickly and securely held together by inserting cotter pin, nail or piece of wire through holes provided for this purpose. The locking ends (heads) are identical for all sizes of hose and threaded ends, permitting the coupling of any two sizes of hose within the hose end range of this coupling; or coupling to any pipe up to 1" by use of threaded connections.

Every detail of "AIR KING" design and construction insures the utmost in efficiency, durability and economy. Each coupling is tested on a "go and no go" gauge to make absolutely certain it is interchangeable.

"AIR KING" male and female interchangeable I. P. T. ends are illustrated below.

Threaded I. P. T. Female End

Threaded I. P. T. Male End

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is Self-Honing, Self-Adjusting . . . and the Handle Can't Come Off!

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AIR VALVE

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(Continued from page 100)

equipment for belts up to 36 in. wide usually consists of the three-roll, antifriction-bearing troughing idler, and single-roll, antifriction-bearing return idlers. Special idlers with a thick lagging of soft rubber should be used at all points where material drops on to the belt. Side guide idlers are usually unnecessary and should be avoided wherever possible because they damage the belt edges in time.

The distances between troughing idlers shown in the accompanying table are recommended for the use in design of conveyors for aggregate and mixed concrete.

IDLER SPACING, IN FEET

MATERIAL	WT., LB. PER CU. FT.	SIZE OF BELT, IN.										
		14	16	18	20	24	30	36	42	48	54	60
Sand or crushed stone	90 to 120	4½	4½	4½	4½	4	4	3½	3	3	3	3
Mixed concrete	150	...	...	...	...	.	2	2	2	2½	2½	2½

Pulleys—The head or drive pulley should have a diameter in inches approximately equal to five times the number of plies in the conveyor belt. The drive pulley should have a high crowned face with a 3/16 or ¼ in. per ft. slope, and lagged with not less than four-ply rubber belting riveted or bolted to the pulley.

The use of pulleys having diameters smaller than recommended makes it necessary to increase the belt tension so that the belt will hug the pulley, which increases the stresses in the plies of duck. Excessive bending also causes the belt carcass to fail and splices to break due to extra stresses set up in the outer plies as the belt bends around the pulley.

The width of pulley faces is usually made equal to the width of belt plus 2 in. for belts 12 to 30 in. wide, and width of belt plus 3 in. for belts 36 to 60 in. wide. These faces will take care of normal misalignments and belt weaving.

Tail pulleys generally have a diameter in inches equal to approximately four times the number of plies in the conveyor belt and a standard crowned face sloping ⅛ in. per foot. If the maximum tension in the belt is at the tail end, this pulley should have a diameter equal to five times the number of belt plies.

In cases where the maximum belt tension is transmitted around snub, deflecting, or terminal pulleys, these auxiliary pulleys should be as large as the drive pulley; that is, 5 in. diameter per ply of belt. Other pulleys can be 3 in. per ply of belt.

The arc of contact of the belt on the head pulley should normally be 210 deg. for the average single drive. Light-duty conveyors with low belt tensions do not require snub pulleys, and the arc of contact will then be about 180 deg. The ordinary return idler should not be used as a snub pulley because of its light bearings and small diameter.

Take-ups

Take-ups may be divided into three classes, *viz.*, horizontal gravity; vertical gravity, and screw type. Those of the grav-

(Continued on page 104)

Beat construction problems before they occur . . .

with efficient planning of work and plant as shown in this new book

Here's a truly money-making volume for contractors, engineers, and others concerned with heavy construction projects — giving you all the essentials of planning the camp, plant, and working schedules to attain the smoothest, most economical, and most productive operation. Largely with specific facts right from the authors' experience on the Tennessee Valley dams, the book shows the vital points to consider in planning the job plant and its operations, and includes many descriptions and data on construction machinery to aid in all the problems of selection and operation.

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and CHARLES H. LOCHER
Contractor

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THE treatment throughout is for practical construction men. The facts and examples are all from typical heavy construction experience. For the first time performance data is assembled for convenient reference on various sizes and types of equipment, including actual experience of production on jobs. So comprehensive and practical is this material that you will get many valuable tips on construction methods from it as well as aid in the selection of equipment.

Many Valuable Tables

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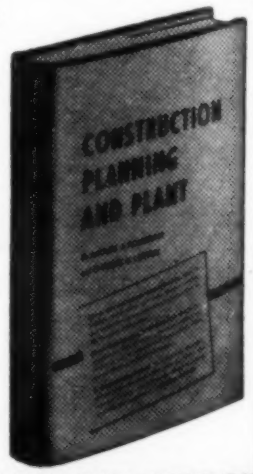
Compressed-air Regulations
Drilling and Mucking



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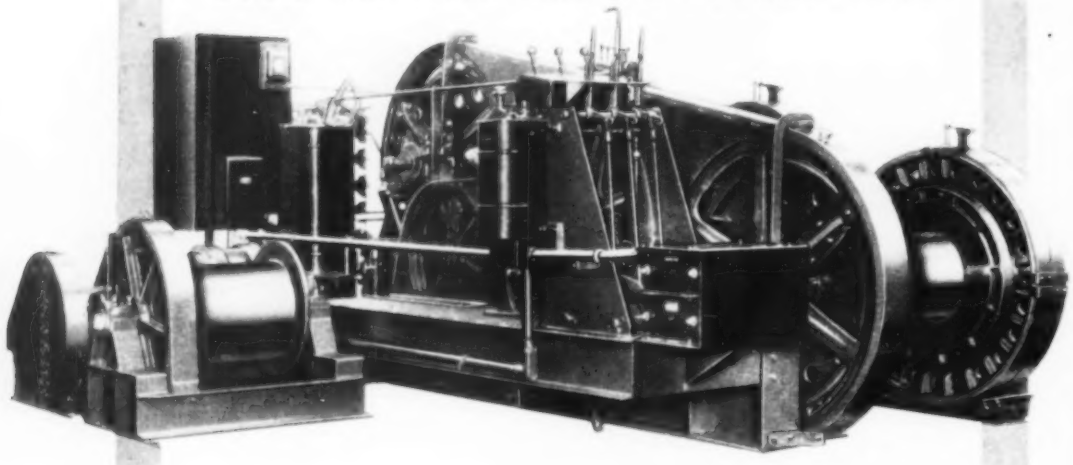

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(Continued from page 102)

ity type are preferred because a constant tension is automatically maintained on the slack side of the belt. Wherever possible a horizontal-gravity-type take-up should be used because the cost of a vertical-type take-up is considerably more, as this type requires three additional pulley assemblies and therefore should be used only when the design of the conveyor does not permit the use of a horizontal type. On conveyors less than 200 ft. long a screw type may be used. In general, the take-up should be placed where the belt tension is low.

When designing a take-up for horizontal conveyors, the length of travel should be determined by allowing 1 per cent for belt stretch and providing travel distance on the take-up frame compensating for at least half the belt stretch. The same rule applies for inclined conveyors, except that 25 per cent greater travel distance should be provided. The amount of counterweight to provide should be the least with which the conveyor can be driven, as determined by an analysis of belt tensions.

Holdback

On inclined conveyors where a reversal of the loaded belt would occur when there is a power failure, a holdback, or automatic self-locking brake, should be installed on the head shaft or countershaft, preferably on the latter to permit the use of a brake having less torque capacity.

The band-brake type of holdback is capable of giving better protection than the ratchet-wheel type, which has proved unsatisfactory because of the sudden shock caused when the pawl strikes a tooth.

Transmission of Driving Power

Several types of transmission systems are available for the drive between the motor and head shaft. The type now used most commonly consists of a geared-head-motor speed reducer and chain drive between the low-speed shaft of the speed reducer and the head pulley shaft. The selection of this type of drive eliminates alignment difficulties which may occur in mounting the flexible coupling between the motor and an independent speed reducer and between the speed reducer and the head shaft. An added advantage lies in the fact that the conveyor speed can be conveniently increased or decreased at small cost by using various combinations of sprockets in the chain drive. The latter advantage is more appreciated in adapting the equipment from requirements on one job to those on another.

Tandem Drives

Where it is necessary to transmit a large amount of power into a belt with considerable length or elevation, the frictional contact on the head pulley is supplemented by an auxiliary driving pulley around which the belt is passed and held in contact by a take-up or snub pulley, to develop a greater arc of contact.

Tandem drives cut down the maximum belt tension and avoid the necessity of in-

(Continued on page 106)

A section of the Leschen Laboratory where wire is being tested to determine its fitness. In this department are many other instruments, among which is an 800,000 pound capacity machine for determining the actual breaking strength of completed wire ropes.

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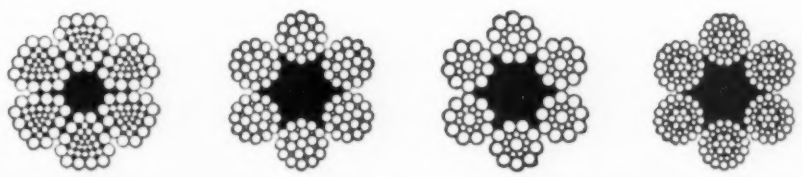

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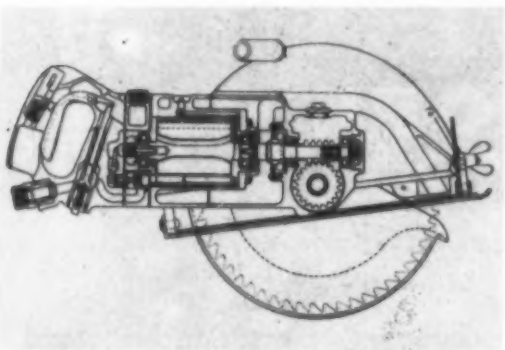


(Continued from page 104)

creasing the number of belt plies or the belt width. Too many plies are objectionable because they make the belt too stiff, and extra width invites overloading the belt. Since the face of the belt in contact with the material goes around the tandem pulley, it is important to install a suitable wiper, preferably of the rotary motor-driven type, to keep the face clean.

Motors

After the various features of mechanical and structural design have been determined, and the horsepower at the motor drive shaft has been calculated, the problem of selecting a satisfactory electric motor and its control remains. For construction-plant work, the three-phase a.c. motor in the double squirrel-cage type (NEMA class C, high starting torque, low starting current) is the most commonly used. The wound-rotor induction motor is adaptable where definite control of starting current is necessary owing to large horsepower required, controlled acceleration, or where relatively higher starting torques are a requirement.

The difference between starting and running frictions, the inertia of the load, and the fact that grease in the various idler and mechanical bearings is usually cold at the start, all dictate a higher torque to start a loaded conveyor than is needed after the belt is up to speed. For the average conditions either a double squirrel-cage or wound-rotor motor has ample starting torque.

Motor Controls

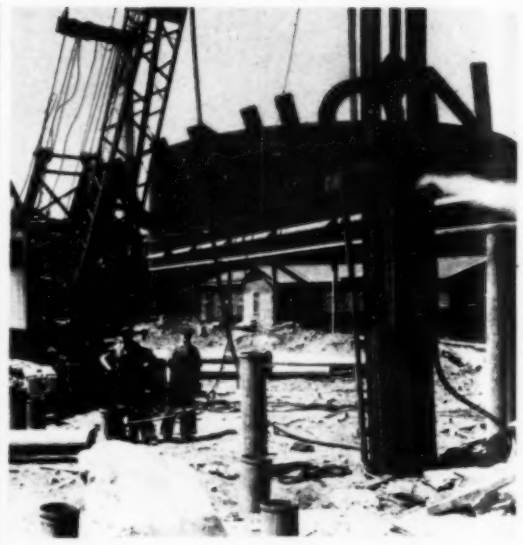
For across-the-line-start squirrel-cage induction motors, all the desirable features for control have been included in the standard combination fusible magnetic switch.

Wound-rotor induction-motor control consists essentially of two interrelated units, primary control and secondary control. For motors of small capacity, the combination magnetic switch mentioned above is used for primary control. Secondary control, which governs acceleration and speed, is accomplished by a resistor unit with either a drum controller or magnetic control panel and drum switch arranged to short out sections of the resistor unit in time steps.

Conveyor Supports

Timber supports are good enough for most ordinary installations where no long spans are involved.

Steel structures, owing to their temporary nature, are generally designed for higher allowable stresses than given by the A.I.S.C. A minimum of three rivets or bolts should be used for main member connections and not less than two rivets



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or bolts for connecting secondary members and bracing.

An economic study of long steel trusses for conveyors indicates that a span length of about 80 ft. is the most economical. This length also permits the truss being shipped in two pieces.

The type of conveyor bridge may be varied. At Norris dam, through bridges were used. All conveyor bridges were Pratt trusses 8 ft. high and 7 ft. 6 in. apart, with top and bottom bracing. Warren trusses 10 ft. high and 12 ft. on centers were used for the screening structures.

At Pickwick Landing dam deck-type

FROM BORROW PIT at Shasta dam, in California, material for concrete aggregate, excavated by walking draglines, is loaded on to belt conveyor for delivery to mixing plant.

conveyor bridges, each consisting of Warren trusses 5 ft. 6 in. high, 5 ft. on centers, were chosen because of their lighter weight and simpler fabrication. For shorter spans the Warren truss is lighter than the Pratt truss of equal length, and fabrication is slightly easier. The deck-type truss structure is very practical and economical. A walkway and hand railing on one side of the conveyor is usually sufficient, and the conveyor itself should be covered with a series of curved plates set high enough to permit inspection of the load from the side.

Warren-type deck trusses similar to those used at Pickwick Landing and Guntersville dams were designed for the new conveyor bridges at Hiwassee dam, and in order to facilitate reuse on other projects, pin bearings were adopted for these trusses.

Design of Belt Conveyors

For making preliminary designs and cost estimates which can later be followed by more exact analysis, if needed, two sets of curves, prepared by Frank T. Matthias, are reproduced in the book "Construction Planning and Plant," by Ackerman and Locher and are accompanied by explanatory notes covering belt speeds and selection of proper belt width, horsepower required, belt tension and belt plies.

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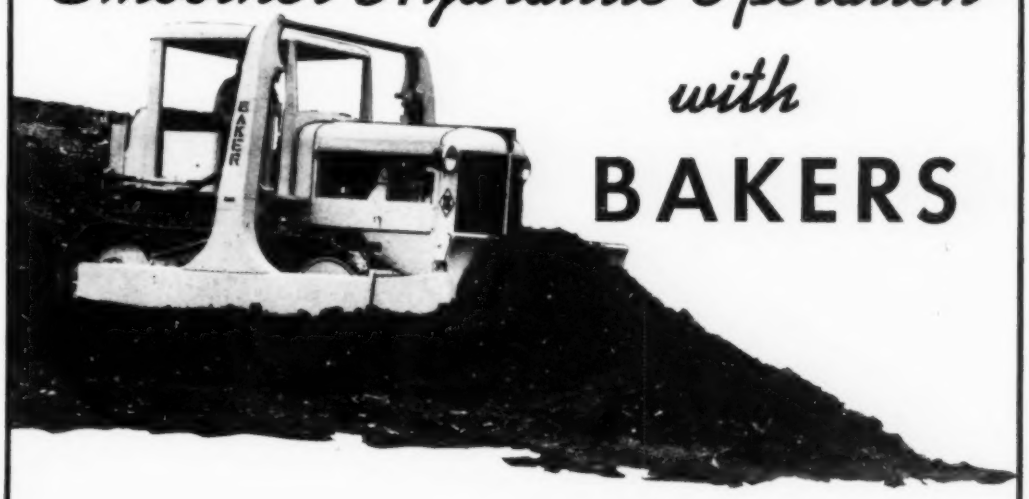

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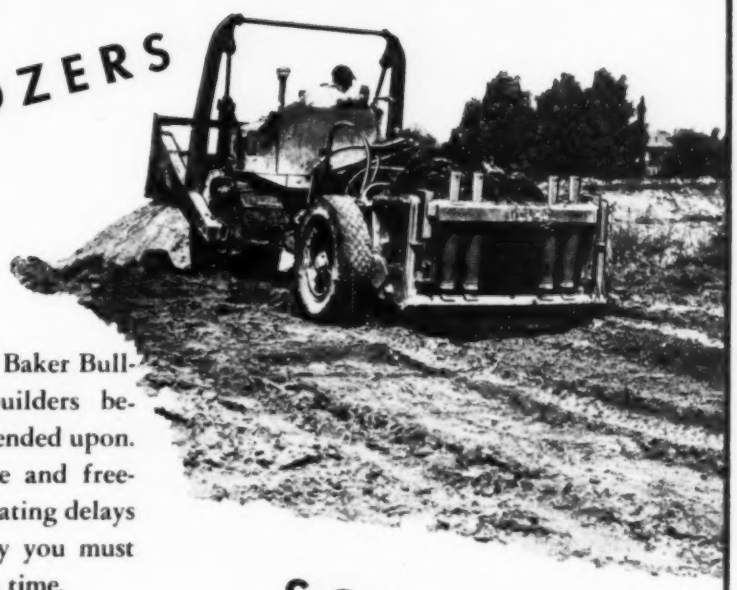

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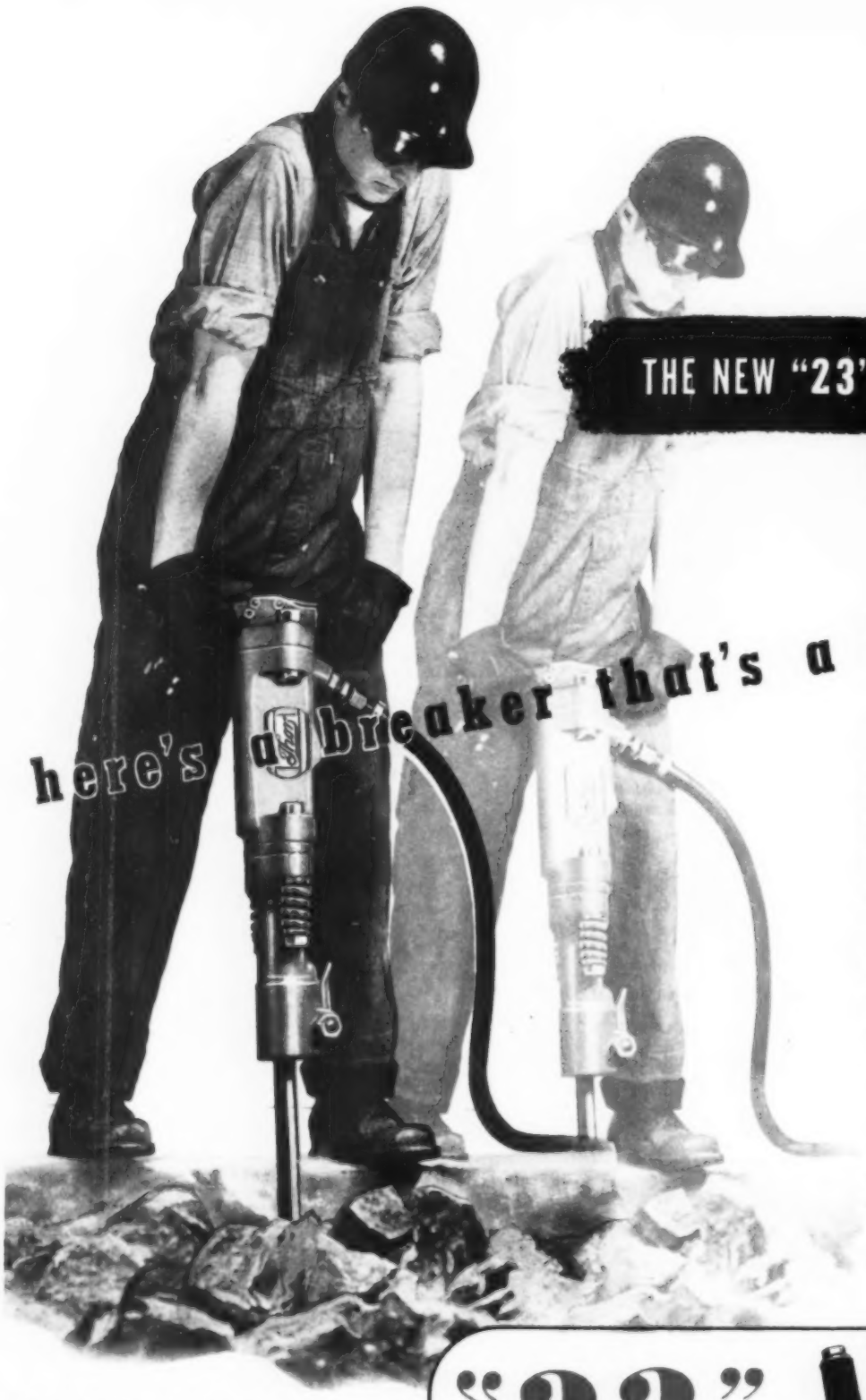

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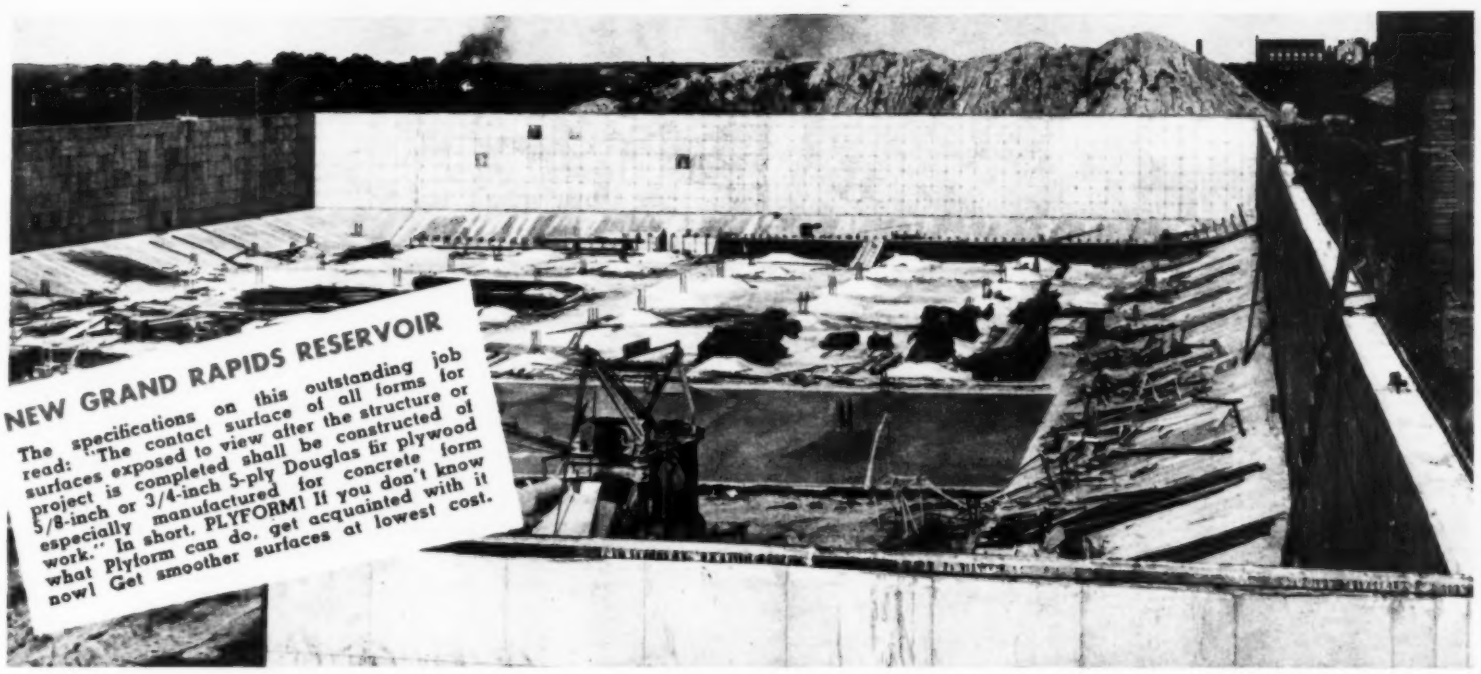

NEW GRAND RAPIDS RESERVOIR
The specifications on this outstanding job read: "The contact surface of all forms for surfaces exposed to view after the structure or project is completed shall be constructed of 5/8-inch or 3/4-inch 5-ply Douglas fir plywood especially manufactured for concrete form work." In short, PLYFORM! If you don't know what Plyform can do, get acquainted with it now! Get smoother surfaces at lowest cost.

SMOOTH!... that's the way concrete is when formed against PLYFORM

● Plyform, the grade of Douglas Fir Plywood made especially for concrete form use, is rapidly becoming the standard form material wherever specifications call for exposed concrete surfaces. It produces smooth, flawless concrete . . . minimizes rubbing and finishing. The big panels give 100% coverage . . . strip easily . . . can be re-used over and over again if handled with reasonable care.

But be sure and specify Plyform when you order. Don't take chances with ordinary plywood, which isn't engineered to the demands of concrete form work. Plyform is made from special materials with special care. Yet, in most areas, it costs just over 1c a square foot more than SO2S Plypanel of the same size and thickness. You can always identify Plyform panels instantly by their diamond-shaped "grade trade-marks" and silver-green edge seal. For more information, write Douglas Fir Plywood Association, Tacoma Building, Tacoma, Washington.

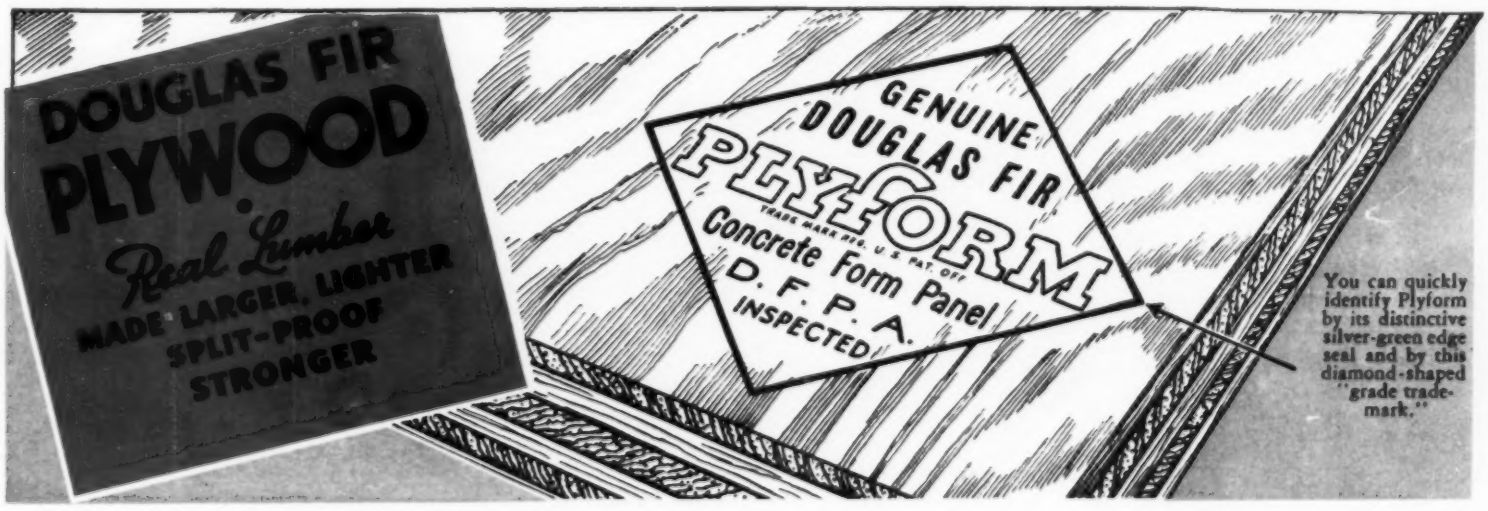
Why Plyform is better . . .

1. Plyform is manufactured in strict accordance with U. S. Commercial Standard CS45-38, by Association mills. Only special highly water-resistant premium glues are used. The cores of the panels are better than those used in standard interior types of Douglas Fir Plywood. The faces are similar in appearance to SO2S Plypanel but must be at least 1/8" thick before sanding.

2. Both sides of every Plyform panel are usable for forming smooth concrete surfaces. Plyform serves as sheathing and lining combined.

3. Every panel is sanded satin-smooth, oil-treated and edge-sealed at mill.

4. The distinctive silver-green edge seal and diamond-shaped "grade trade-mark" stamped on every Plyform panel are positive, instant identifications of a genuine Plyform panel. Specify Plyform on your next job.



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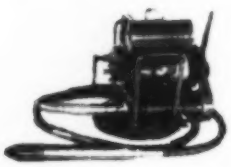

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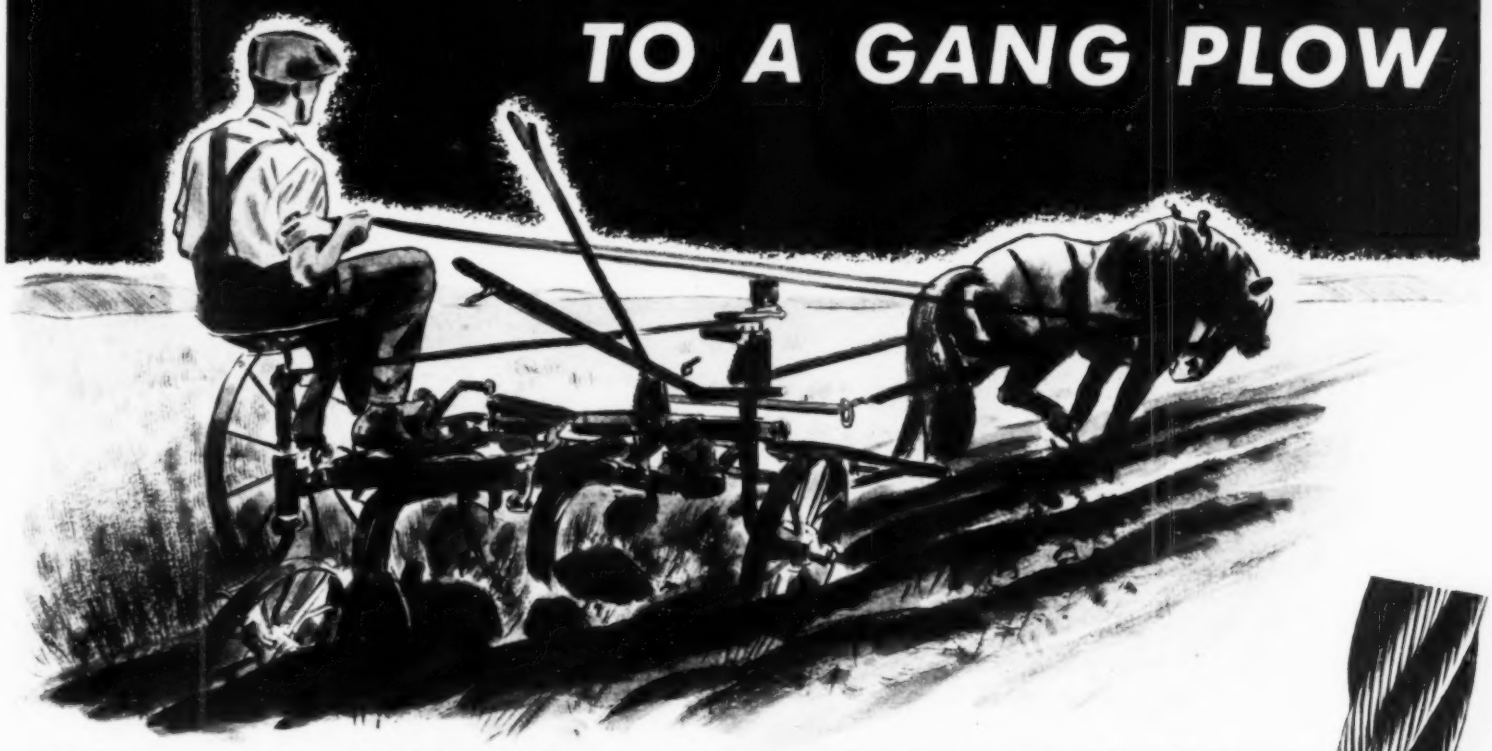

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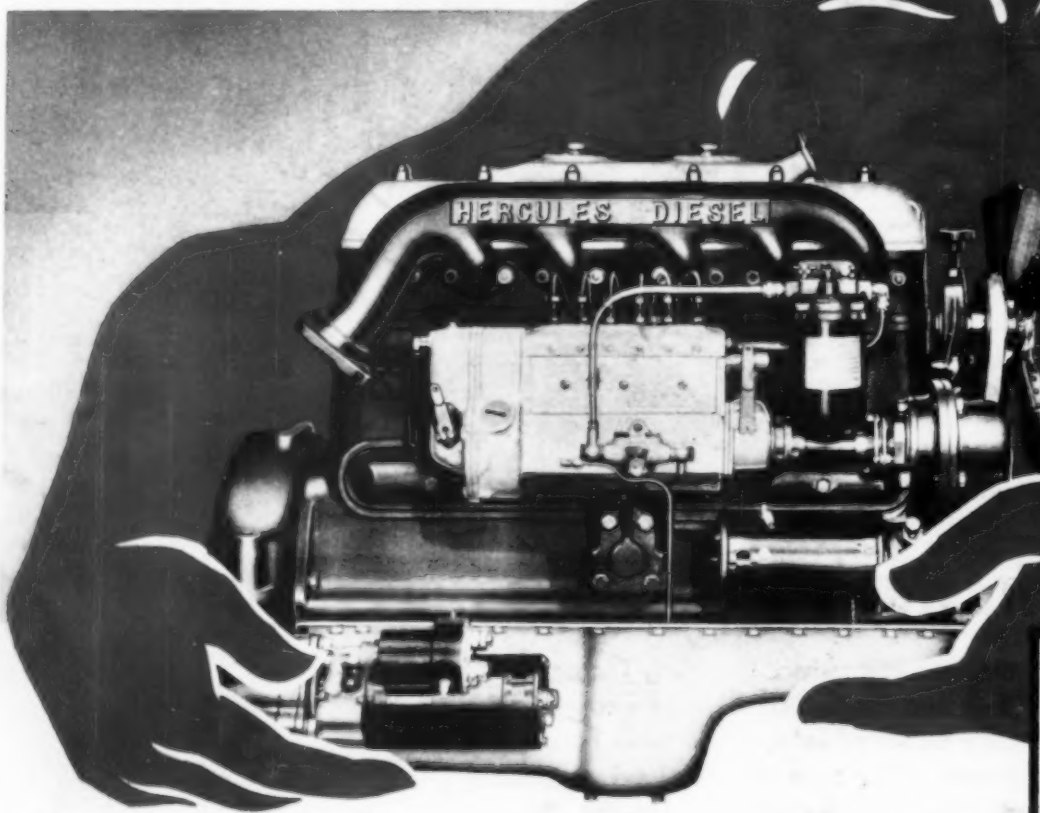

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